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THESIS

ELECTRONIC DATA INTERCHANGE
IN
U.S. NAVY CONTRACTING ACTIVITIES

by

Paul T. Jensen

December 1992

Thesis Advisor:

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IN
U. S. NAVY CONTRACTING ACTIVITIES

by

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Lieutenant Commander, Supply Corps
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B.S., University of Wisconsin - Platteville, 1978

Submitted in partial fulfillment
of the requirements for the degree of

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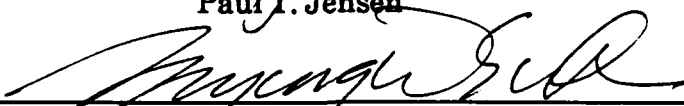
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ABSTRACT

Electronic Data Interchange (EDI) the computer-to-computer or more specifically the application-to-application exchange of business data in a standard format. Achieving the large savings mandated by, Defense Management Review Decision (DMRD) 941 requires integration of EDI capability into Navy automated procurement systems. This thesis examines the use of EDI in the U.S. Navy procurement function, as well as areas for expanded utilization of EDI, current barriers to implementation, and lessons learned while planning and implementing EDI initiatives.

U.S. Navy EDI initiatives involve a wide range of projects in the procurement process. The initial areas targeted are the high volume found in the small purchase area, and delivery orders against established contracts.

A major barrier to full use of EDI in U.S. Navy Contracting Activities is the legal and regulatory impediments, resulting from a lack of specific guidance in the Federal Acquisition Regulation. Contributing to the success of EDI are, command involvement, functional area participation, and networking among users.

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I. INTRODUCTION

A. BACKGROUND

Electronic Data Interchange (EDI) is the computer-to-computer or more specifically the application-to-application electronic exchange of business documents using a standard format. Utilizing EDI, businesses previously passed between trading partners¹ in printed versions, documents such as purchase orders, RFQs (request for quotations), responses to RFQs, bills of lading, and invoices, can be translated into an agreed upon standard format. These business data now in an electronic format may be transmitted directly into a trading partner's computer application.

Every business entity, commercial or Government, interacts daily with numerous customers, suppliers, and other business partners. For many years early users of EDI in industries such as automotive, grocery, pharmaceutical, and transportation utilized EDI technology based on proprietary formats. Other industries have only recently begun using EDI, however many still employ costly paper based processes.

The adoption of cross-industry standard EDI formats contributed to a dramatic increase in the number of EDI users

¹Trading partners is a term used in EDI to define two or more organizations who have an established business relationship. A common example being a buyer-seller relationship.

in both the United States and European countries. Current estimates of the number of EDI users are 10,000 (1990) with the number expected to increase by 25 to 35 percent each year through the mid 1990s (DISA, X12 Intro to EDI, 1990, p. 10).

Electronic Data Interchange should not be thought of as automation of existing paper processes. A major motivation for the automated interchange between applications is the elimination of repeated manual entry of business data.

Figure (1) illustrates both the current paper based process and a simplified version of an EDI process for a common transaction between trading partners. The key aspect of this illustration is the lack of requirement for repeated entries of the same data as they are passed between EDI applications.

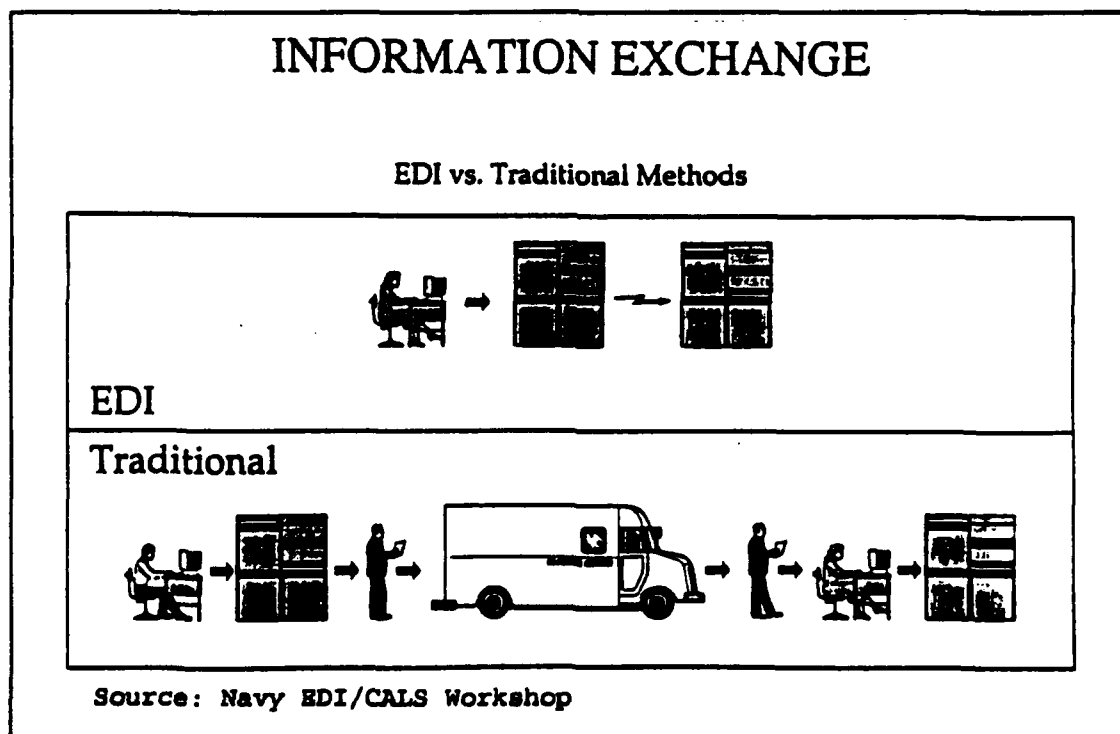


Figure 1. Simple EDI Process

Numerous Defense Logistics Agency (DLA) and several Navy procurement activities are currently using EDI transactions to advertise requests for quotations and to transmit various forms of purchase orders to trading partners. These initiatives will be discussed in detail in subsequent chapters. Much of the current EDI literature projects savings in data entry, reproduction, and mailing costs. While little actual data were available on specific savings within DoD activities, some DLA activities have realized significant savings in terms of customer response times and dramatically reduced inventory levels for many categories of material.

B. OBJECTIVE

This thesis will examine the current utilization of EDI in the United States Navy, primarily in the procurement function, and the areas for planned expansion of EDI use. It will also determine if there are common areas of difficulty in implementing EDI applications.

The Naval Supply Systems Command Strategic Plan for EDI contains the following summary of where EDI fits into the various Logistics and Information Systems initiatives.

Electronic data interchange is just one way the DoD is improving the way it operates. OSD management considers EDI a part of the Corporate Information Management (CIM) initiative. CIM is restructuring the DoD's information processing environment by replacing Service-unique systems for payroll, logistics, and other support functions with standard applications....Besides EDI, CIM also includes Computer-aided Acquisition and Logistic Support (CALS).

The CALS initiative promotes the paperless exchange of technical information during the development and operation of a weapon system. In many cases, exchange of technical information employ the business transactions supported by EDI. Another initiative related to EDI is Total Quality Management (TQM). This initiative focuses on changing the business process to improve worker productivity and quality. As stated above, such changes are required to fully exploit EDI technology. (NAVSUP, November, 1991, p. 1-7).

Given this strategic plan, the issue with EDI is now one of how fast EDI must be deployed and what areas can incorporate EDI in a realistic manner.

C. RESEARCH QUESTIONS

To achieve the objective of the research, the following primary research question was posed: What are the current applications of electronic data interchange (EDI) technology in U.S. Navy contracting activities, and what barriers must be overcome to enhance utilization of EDI technology?

To answer the basic research question, the following subsidiary questions were asked:

1. How is EDI being used in the private sector and within the Department of Defense?
2. What applications of EDI are presently in use at Navy contracting activities?
3. What are the future applications of EDI in the contracting area?
4. What problems or barriers exist to current and future uses of EDI in Navy contracting applications?

5. What actions must be taken to enhance the use of EDI technology in the Navy?

6. What is the relationship between Computer-aided Acquisition and Logistic Support (CALS) and Electronic Data Interchange?

7. What are areas of further research for the use of EDI in contracting applications.

D. SCOPE

Electronic Data Interchange has many present and future applications in the areas of acquisition and contracting, logistics, and financial management in the Department of Defense. This thesis will examine current U.S. Navy policy and plans for utilization of EDI to enhance the acquisition and contracting process.

E. METHODOLOGY

The research methodology used in this thesis includes literature review and personal and/or telephone interviews with appropriate Navy and Defense Logistics Agency personnel. This methodology enabled the researcher to determine Navy procurement activities' present involvement in EDI, future initiatives in EDI, and implementation issues and barriers.

F. DEFINITIONS AND ABBREVIATIONS

A comprehensive glossary of abbreviations and acronyms used within this thesis is presented in Appendix A.

Working definitions of terms and concepts used in this thesis will be provided as footnotes when deemed necessary.

It is assumed that the reader is familiar with the Federal Acquisition Regulation (FAR) and automated U.S. Navy procurement processes, and has an understanding of management information systems in general.

G. ORGANIZATION OF STUDY

This thesis is organized to provide the reader with a conceptual overview of EDI, its developmental history, current and future applications, and lessons learned during planning and implementation.

Chapter II serves as an introduction to EDI, addressing the developmental history of the various standards, a summary of current industry applications, and DoD policy for the use of EDI. Chapter III describes current DoD and Navy EDI applications.² Chapter IV discusses several current issues in EDI, including legal, small business, and standardization. Chapter V provides an analysis of findings. Chapter VI delivers conclusions and recommendations and identifies topics for additional research.

²While the emphasis of Chapter III will be procurement related, various logistics related initiatives will also be presented to give readers unfamiliar with EDI an exposure to the wide variety of potential applications of EDI technology.

II. BACKGROUND

Electronic Data Interchange (EDI) has its early roots in both commercial and DoD sectors. In the mid-1960s, EDI capability emerged as the use of computer resources became more widespread.

The emerging communication technology in the mid-1960s allowed trading partner computer systems to exchange information electronically. Almost 30 years later, continually evolving computer communication technology and wide spread use of microcomputers have been a dominant factor in the dramatic increase in use of EDI applications in the early 1990s (EDI/CALS Workshop 1992). This chapter describes the history of EDI progress and development over the past 30 years, provides a conceptual overview of how EDI works, and offers examples of commercial applications.

A. WHAT IS ELECTRONIC DATA INTERCHANGE?

EDI is the computer-to-computer or application-to-application exchange of business documents using a standard electronic format.

Several EDI publications have reported that 75 to 80 percent of all data entered into business computers come from other computers. Utilizing standardized EDI transactions, business data previously passed between trading partners in

printed versions such as purchase orders, RFQs, and responses to RFQs, bills of lading, and invoices can be transmitted to a trading partner's computer application without human intervention. Eliminating duplicate data entry efforts saves time, minimizes potential for error, and reduces related business expenses such as printing of various forms, photocopying, phone calls and mail handling.

While EDI normally means the digital exchange of "business documents", there are other interpretations of EDI with a much broader definition. The DoD encompasses all forms of digital exchange of business information/data under "Electronic Commerce". Electronic Commerce (EC) is the broad plan for integrating EDI, electronic mail (E-mail), electronic bulletin boards, electronic funds transfer (EFT), and internal processing into a comprehensive system supporting all business functions including procurement, contract administration, payment, supply management, transportation, and many other logistics applications. (EDI/CALS Workshop notes, 1992)

Of the many elements making up Electronic Commerce, EDI is the philosophy that is the basis of EC. As a comparison, EDI is different from E-mail in that EDI messages are not intended for free-style text.

B. HISTORY OF ELECTRONIC DATA INTERCHANGE

In the late 1960s, the transportation industry (air, truck, rail, and shipping) began developing an EDI capability

to help reduce and eliminate delays resulting from an increasingly large volume of paper documents. To coordinate this early effort, an industry group known as the Transportation Data Coordinating Committee (TDCC) was formed in 1968. The TDCC has been a driving force in promoting the use and benefits of EDI for over 20 years. In 1987 the TDCC changed its name to the Electronic Data Interchange Association (EDIA) which reflected a broader interest and role in promoting a greater cross-industry use of EDI. (Hinge, 1988) Another effort was initiated in 1968 by a group of California banks to study the paperless exchange of funds in lieu of checks. This effort was the beginning of what we now call Electronic Funds Transfer (EFT).

During the early developmental phases of EDI, the TDCC had a leading role in the development of industry specific EDI standards by various trade groups. The American Bankers Association formed a committee to study payment systems in 1970. The result of this effort aided development of standards which allowed the establishment of the first automated clearing house in 1972. In 1973 the National Automated Clearing House Association (NACHA) was formed. The NACHA mission was to allow electronic exchange of financial information on a national basis. In 1975 the Government began using the automated clearing house for payments such as military payrolls and Social Security. (Ullrich, 1991, p. 8-9)

In the mid 1970s commercial EDI systems began to emerge. In 1976 American Hospital Supply (AHS) initiated an order entry network linking AHS with its suppliers. In the late 1970s General Electric and National Data Corporation allowed access to their time-sharing network by outside users. At this same time the grocery industry began widespread efforts to use EDI and formed the Uniform Communication Standards (UCS) using TDCC guidance.³

C. ELECTRONIC DATA INTERCHANGE STANDARDIZATION

1. Accredited Standards Committee X12

In 1979 the American National Standards Institute (ANSI) sanctioned the Accredited Standards Committee X12 (ASC X12)⁴ to develop cross-industry standards for EDI. In addition to developing cross-industry standards, the ASC X12 committee charter mandated the development of an entire family of related standards for applying EDI capability to a variety of diverse types of routine business transactions. The goal of the ASC X12 is to:

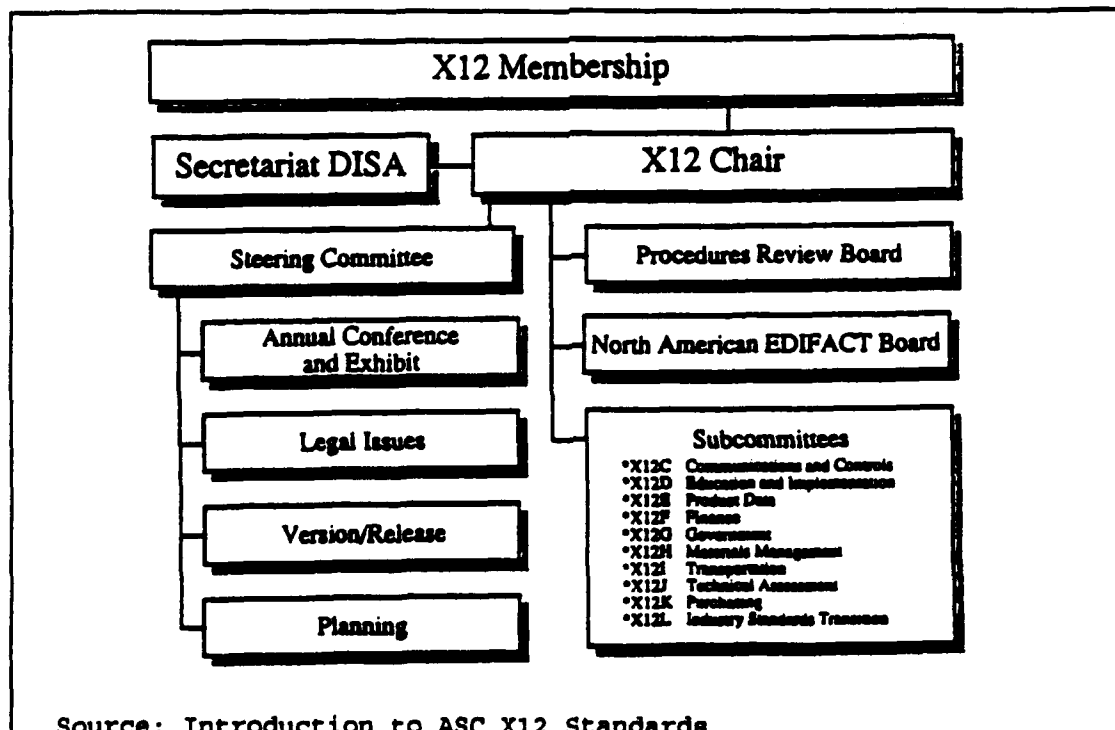
...structure standards so that computer programs can translate data to/from internal formats without extensive reprogramming. In this way, by using internally developed or commercially available software and private or public-access communication networks, ASC X12 believes that all sizes of firms and institutions using intelligent

³In the present environment of DoD procurement, an estimated 37 percent of future procurement actions will be generated by the Defense Commissary Agency (Drake, EDI Opportunities, 1992, p. 4-3)

⁴Throughout this thesis the shortened name ASC X12 is used.

computational devices can benefit from use of the standard. The efficiencies of a standard interchange format can greatly reduce the difficulties and expense if each institution were to impose its own formats on every other institution with which it does business (EDI X12 Intro, 1990, p. iii)

To accomplish its role, various ASC X12 subcommittees develop and recommend new standards for the full ASC X12 membership review. Each new standard recommended must go through a consensus process by the full ASC X12 membership. Following a trial period after the "draft" standards are released, the new standard is sent to ANSI for their formal consensus approval and registration. As seen in Figure 2, the ASC X12 subcommittees have applications for a wide range of business, Government, and other functions.



Source: Introduction to ASC X12 Standards

Figure 2. ASC X12 Organization

2. Increased Commercial Use of Electronic Data Interchange

In 1982 the grocery industry completed its first EDI transaction and initiated an industry wide EDI pilot program. At this time interest in EDI increased dramatically. An example of the increased interest was the formation of the Automotive Industry Action Group to study methods to increase the competitiveness of the American automotive industry. By 1986 there were 13 approved ASC X12 standards and a large number of organizations, including automotive manufacturers, began announcing they expected suppliers to utilize EDI transactions.

3. International Standards

In 1985 American and European EDI groups initiated efforts to develop international EDI standards that have become known as United Nations/Electronic Data Interchange for Administration, Commerce and Transportation (UN/EDIFACT) The first EDIFACT transaction sets became available in 1988. (Texas Instrument, 1991) At the present time ASC X12 is dominant in North America and EDIFACT is dominant throughout many other areas of the world. One exception to this is in Japan where there is still widespread use of proprietary EDI formats.

4. U. S. Government Adoption of Electronic Data Interchange Standards

In March 1991 the U.S. Government adopted ASC X12 and EDIFACT as standard EDI formats under the Federal Information Processing Standard (FIPS) 161. In part, FIPS 161 states the U. S. Government recognizes the coexistence of both standards and that efforts are being made to align the standards as closely as possible, eventually providing for full compatibility between syntaxes and data dictionaries. "For planning purposes the U.S. Government recognizes the objective of the X12 standards to align with the UN/EDIFACT standards by 1994" (CSL, FIPS 161, 1991, p. 5).

Appendix B identifies the wide range of ASC X12 transaction sets both approved and proposed.

D. TECHNICAL ASPECTS OF ELECTRONIC DATA INTERCHANGE

The flexibility inherent in EDI standards permits almost any purchasing type document to be translated (mapped) into an EDI transaction format, as demonstrated by the successful use of EDI by several Government EDI procurement and contract administration projects to communicate purchase orders, delivery orders, RFQs, shipment and payment notices.

(Drake, 1990)

1. Electronic Data Interchange Mapping

Mapping is the process of determining the most appropriate data elements within an ASC X12 transaction in

which to place the data to be transmitted from your application software system. Data mapping extends the EDI process by using the values received as though they had been entered into the user's information system locally.

(Gerson, 1989, p.1)

Mapping must be a joint effort among trading partners. As seen in both industry and DoD, document mapping decisions are usually established through "implementation conventions".

The DoD Executive Agent (DLA) for EC/EDI has responsibility for developing and publishing implementation conventions for the DoD. This was accomplished through publication of Volume II of the DoD Implementation Guidelines which provides implementation conventions for mapping DoD related EDI transactions. The DoD implementation conventions are a major part in the effort to present a "single face to industry" by DoD activities.

Appendix C provides an example of a purchase order and corresponding hard copy example of the same data when placed in the EDI ASC X12 850 [Purchase Order] transaction set.⁵ It is emphasized that the process of translating any particular document is not a function performed by operating personnel.

⁵Detailed guidance on EDI transaction mapping is available in Volume II of the DoD Implementation Guidelines for Electronic Data Interchange dated December 1991. The DoD guidelines establish a baseline of DoD's conventions for implementing many of the established transactions sets. The actual step by step methods of mapping a transaction is found in a set of ANSI ASC X12 publications.

The actual EDI transaction should be transparent to users. The avoidance of developing and using non-standard transaction sets or data elements resulting in "human intervention" is an important key to successful EDI planning and implementation. This thought is embraced in much of the EDI literature.

2. Electronic Data Interchange Translation

Translation of EDI transactions is a recurring software activity of converting data between the users application software and the EDI transaction. Typically this is accomplished by using one of many commercially available translation software packages to convert from user specific formats to the applicable ASC Standard prior to transmission. When receiving an EDI transaction from a trading partner the process is reversed.

3. Electronic Data Interchange Communication

Transmission of data between computer applications throughout the EDI cycle has been stated as the primary objective of EDI. A Value Added Network (VAN) can serve as the interface between trading partners. This eliminates the requirement to communicate directly with each trading partner, which can be an important consideration when dealing with many trading partners. Using a VAN enables trading partners to eliminate concerns for translating between ASC X12 and EDIFACT standard formats, and eliminate the requirement to schedule

specific transmission times for transactions through the use of electronic mailboxes.

E. ELECTRONIC DATA INTERCHANGE USE IN THE DEPARTMENT OF DEFENSE

In 1991 the DoD developed an ambitious five year plan to incorporate EDI into the business process. While the concept of EDI is not new to the DoD, recent developments in computer and communication technology offer DoD an opportunity to radically change the way it does business.

1. Early Department of Defense uses of Electronic Data Interchange

During a Navy EDI/CALS Workshop, Featherstone (1992) indicated that the EDI concept is not new to the DoD. Since the early 1960s, the DoD, Federal agencies and many contractors have been using a proprietary EDI standard to electronically transmit logistics and other data in standardized formatted transaction sets within the Defense Logistics Standard Systems (DLSS). The DLSS include Military Standard Requisitioning and Issue Procedures (MILSTRIP), Military Standard Transaction Reporting and Accounting System (MILSTRAP), Military Standard Contract Administration Procedures (MILSCAP), and Military Standard Billing System (MILSBILLS). These early EDI systems had significant limitations primarily in the 80 card column (CC) restrictions, and lack of flexibility to communicate widely with private industry, especially small businesses. (Navy EDI/CALS

Workshop, Featherstone, 1992)

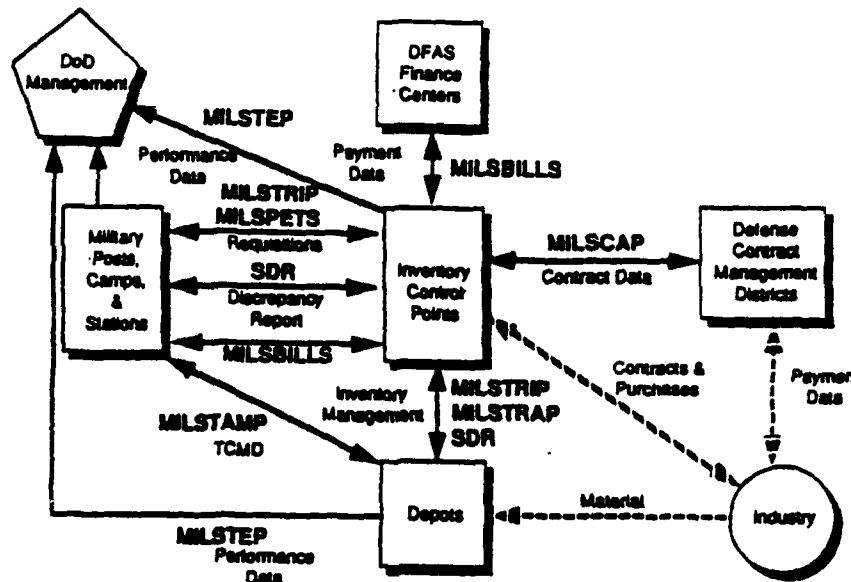
2. Modernization of Defense Logistics Standard Systems

The Modernization of Defense Logistics Standard Systems (MODELS) project is a parallel effort to incorporate EDI into the logistics arena and will change the rules and formats by which DoD logistics activities have communicated for nearly 30 years. (Egan, 1991, p. 1-1) Figure 3 is an illustration of the existing logistics communication environment under DLSS and the expected environment under MODELS which utilizes EDI transactions and incorporates modern communication technology. Changes into the Defense Logistics Management System (DLMS) will take many years because of extensive changes required to re-engineer existing procurement and logistics computer applications.

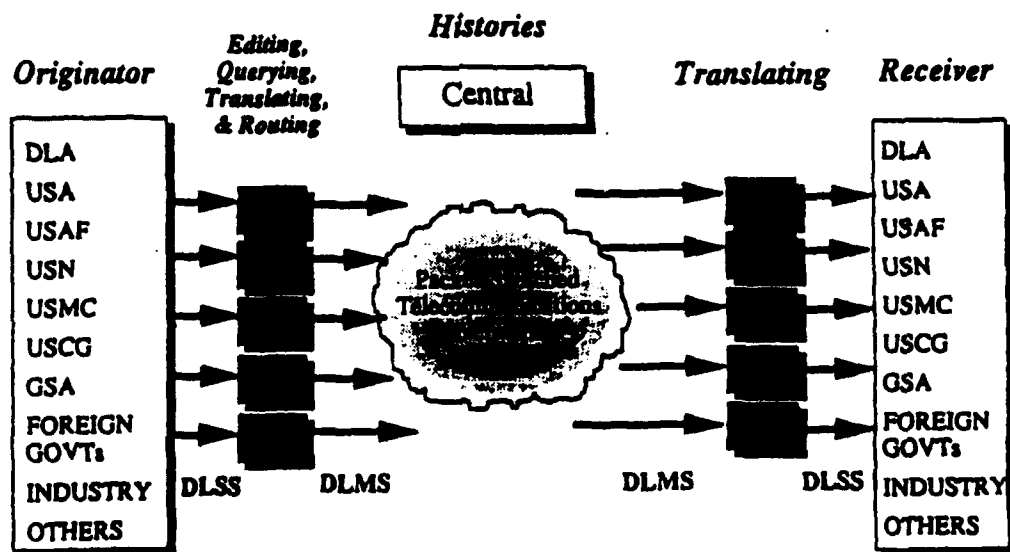
The impression the researcher gained from the literature was that, while expensive, the requirement to re-engineer existing systems was considered a benefit and positive opportunity. In a recent LMI report, Egan (1991, p. v) indicates that, flexibility of design is a fundamental criterion in MODELS.

MODELS is designed for compatibility with ongoing or planned modernization of Service and agency automation projects. Thus new initiatives, such as the Corporate Information Management (CIM) effort and numerous Defense Management Report Decisions, provide excellent methods for the deliberate implementation of the significant improvements MODELS brings to logistics processes.

DLSS ENVIRONMENT



MODELS COMMUNICATIONS



Source: Navy EDI/CALS Workshop

Figure 3. DLSS and MODELS Communication Environment

An important factor to emphasize is that re-engineering of existing systems will not delay implementation of EDI applications. To ease this transition in implementing the DLMS, logistics gateway node (LGN) computers with specialized hardware and software will be provided for this purpose at activities generating substantial logistics communication. The primary function of the LGN is translation between the fixed (DLSS) and EDI compatible variable (DLMS) length formats.

The Executive Summary of MODELS Volume I is provided in Appendix D. The MODELS/DLMS is a very complex initiative and readers unfamiliar with the initiative may benefit by reviewing the entire contents of the LMI report. (Egan, 1991)

3. Initial Electronic Data Interchange Directives

The Deputy Secretary of Defense, in a memo to all military Departments and Directors of Defense Agencies dated 24 May 1988, called for maximum use of EDI for the paperless processing of all business-related transactions. In his memo Secretary Taft stated the EDI initiatives in moving toward a paperless environment were consistent with DoD's commitment to improve productivity. The memo also stresses the "timely, effective and consistent implementation of EDI between DoD and industry," and designated the use of ASC X12 EDI standards to provide a common approach to implementation and a single, coordinated DoD position to industry. (Taft, 1988)

The Deputy Secretary of Defense for Production and Logistics in a 7 May 1990 memo designated the Defense Logistics Agency (DLA) as the Executive Agent for EDI within the DoD.

4. Defense Management Review Decision 941

Defense Management Review Decision (DMRD) 941 entitled "Implementation of Electronic Data Interchange in DoD." accelerated the use of EDI within DoD by programming cost reductions into the budgets of each Military Department and DLA beginning in FY 1992. The greatest potential for savings projected by DMRD 941 are in the procurement/contract administration and payment areas. The cost savings projected in DMRD 941 are \$548 million throughout FY 1999 with a modest increased investment in hardware, software, and training over a five year implementation plan. The projected savings identified in DMRD 941 are based on converting 16 of the most common purchasing and logistics related forms into an EDI transaction. This small set of documents was determined to have the greatest potential for rapid implementation and payback. The 16 forms identified in DMRD 941 are listed in Table I.

Table I. DMRD 941 KEY EDI CANDIDATES

<u>DoD Form</u>	<u>Type of Form</u>
Procurement/Contract Administration:	
DD 1155	Order for Supplies and Services
SF 18	Request for Quotation
SF 30	Amendment of Solicitation/Contract Modification
DD 250	Material Inspection and Receiving Report
SF 129	Solicitation Mailing List Application
SF 1443	Contractor Request for Progress Payment
Transportation:	
SF 1103	Freight GBL, CBL, and Public Voucher
SF 1203/1113 619/619-1	Personal Property GBL, Statement of Accessorial Services
SF 1169	Government Travel Request and Public Voucher
MT 364R	Standard Tender
Supply/Maintenance:	
SF 364	Report of Discrepancy
SAV 926	Monthly Report, Receipt of Repairable
SF 368	Product Quality Deficiency Report
SF 362	Transportation Discrepancy Report
Fuels:	
DD 1898	Aviation Fuel Sales Slip

While the goal of DMRD 941 is to achieve the previously mentioned savings, "the budget reductions will occur regardless of whether the Departments and DLA implement

EDI" (DMRD 941, 1990). Annual personnel end-strength reductions were to begin in FY 1992 and appropriation reductions are to begin in FY 1993. A multi-year investment of approximately \$85 million for EDI operations, maintenance, systems development, and training began in FY 1992. Department of the Navy funding for EDI development and training is centrally managed by the Navy Electronic Commerce Project Office within the Naval Supply Systems Command.

5. Department of Defense Electronic Data Interchange Organization

"As DoD's Executive Agent for EC/EDI/PLUS⁶, DLA is taking the initial steps to standardize and establish standard support components under which DoD will conduct its program." (ASD P&L, 1990) The NAVSUP EDI Strategic Plan (1991) discusses the following responsibilities of the Executive Agent for EDI:

- Ensure compliance with policies and standards.
- Provide standard implementation guidelines and establish support agreements.
- Establish and control standard support components for use throughout DoD.
- Provide user systems, facilities, and services where appropriate.
- Ensure a "single face to industry."

⁶EC/EDI/PLUS: PLUS is the Protection of Logistics Unclassified Systems. PLUS deals with data security issues in EC/EDI data transmission.

The DoD program for EC seeks to achieve the following direct and indirect benefits in an all digital environment.

- Lower data entry costs and more accurate data.
- Reduced maintenance costs and faster communication.
- Less overall paperwork.
- Improved cash management and better decision making.

When looking at the potential applications, there are several characteristics/concepts of EDI that are important. (EDI/CALS Workshop notes, 1992)

- EDI is a set of automated business transactions flowing between organizations.
- EDI is the process of linking those transactions to the (business) applications to improve the business process.
- EDI is a philosophy for conducting business. It **integrates** business functions; it is a basis for process improvements; and it establishes the extended enterprise.
- EDI relies on supporting business application software, however EDI is not a computer system.

Automation of existing paper-based processes is not the goal in EDI. "The goal with EDI is to ultimately make a paradigm shift in the business process" (Prendergast, 1992).

The Defense Logistics Agency has created a plan of action to execute the responsibilities as the EDI Executive Agent. The following four items are identified by Hardcastle (1990, pp. 3-1 to 3-2) as key parts of the DLA strategic plan:

Administrative: The executive agent has established an Executive Administrator's office to encourage the use of EDI throughout DoD. This office will focus on such areas as the use of readily accessible technology and industry-accepted standards to develop, test, and provide common capabilities for EDI implementation. It will also determine and submit EDI funding requirement to the Assistant Secretary of Defense (Production and Logistics).

Technical: The Executive Agent has designated the Lawrence Livermore National Laboratory (LLNL) as its lead engineering and research and advanced development support team to implement EDI/PLUS. LLNL is to design the technical configuration of an EDI/PLUS research and development network, design a test bed to investigate promising EDI/PLUS products, develop a pilot system that can be used throughout DoD for implementing EDI, and Contribute to the formulation and acceptance of EDI/PLUS standards.

Functional: The Executive Agent has designated the Logistics Management Institute (LMI) as a Center for Excellence for EDI/PLUS. LMI is to advise on the organization and structure of EDI/PLUS programs; formulate operational concepts and assist in selecting EDI/PLUS applications for demonstration in the areas of procurement, contract administration, payment, supply, maintenance, and transportation; assist the Military Services and Defense agencies in modernizing existing logistics systems to incorporate EDI techniques; and identify the requirements for a comprehensive PLUS program.

Security: The Executive Agent plans to address all EDI security issues through the PLUS initiative. Its objective is to identify an automated security system designed that will protect and safeguard all forms of unclassified or sensitive data. Both "outside" and "inside" layers of security will be required. Examples of outside layers of security include electronic signatures data encryption, digital data conversion, standards and regulations. Inside layers may include access security, data security, systems security, and applications security. PLUS will also include development of a variety of plans including training, deployment, continuity of operations, configuration management, maintenance, and logistics support.

6. U.S. Navy Electronic Data Interchange Organization

Subsequent to the issuance of DMRD 941, The Naval Supply Systems Command (NAVSUPSYSCOM) was designated as the Navy Executive Agent for EDI. The Naval Supply Systems Command is responsible for coordination of DMRD 941 in the Navy and also for coordinating efforts with the DoD EDI Executive Agent located organizationally within the Defense Logistics Agency. In an August 1991 Quarterly Progress Report on DMRD 941 implementation to the Assistant Secretary of the Navy (C4I/EW/SPACE PROGRAM), the NAVSUPSYSCOM identified the following problems with several aspects of the timetables and projected savings targeted by DMRD 941:

- Savings estimates are based on very small samples assuming that all required industry trading partners are (or would become) EDI-capable.
- Not all 16 paper forms are immediately available as approved standard transactions. (The standards approval process takes 6-18 months).
- The implementation timetable does not account for the resolution of several key legal issues, such as changes in the Federal Acquisition Regulation (FAR).
- Investment requirements are understated.
- Cost and end-strength reductions overlap those already assessed by DMRDs 901 [Reducing Supply Costs], 910 [Consolidation of Finance and Accounting], 915 [Reducing Transportation Costs], 916 [Streamline Contract Management] and 987 [Inventory Reduction].

F. COMMERCIAL BENEFITS

EDI is producing very positive results in the commercial sector. As of 1990, there were an estimated 7,500 to 10,000 EDI users in North America and 12,000 to 15,000 total users worldwide. Projections of the annual growth rate of EDI varied by source with a 25 to 35 percent annual growth rate as the common figure cited. (DISA, X12 Intro to EDI, 1990, p. 10)

From its early inception, some in private industry have been quick to realize the benefits of EDI which generally fall into the following areas:

- Increased responsiveness and value to customers.
- Improved competitive position.
- Support customer initiatives.
- Gain/increase a competitive edge.
- Eliminate repetitive work (e.g., data entry) between trading partners.
- Reduce inventory levels.
- Quicker response to market trends.
- Assume leadership role.
- Utilize existing computer network services.

Tangible effects and results of commercial EDI applications may be seen by reviewing any of the numerous trade publications from a variety of industries.

The following are several examples of how various commercial concerns have benefitted from EDI.

- Hewlett Packard estimated 25 to 40 percent reduction in purchasing agents' time, 60 percent reduction in costs per purchase order and confirmation, 25 percent increase in administrative staff efficiency, 35 percent overall savings in accounts payable processing costs, and 20 percent data entry savings.
- Digital Equipment Corporation reported a 75 percent reduction in purchase order costs.
- NAVISTAR International realized \$5.00 savings for every business communication.
- In the retail industry WalMart has 1600 trading partners, K-Mart has 1100, and Sears has 1000.
- Super Value stores reported EDI produced savings of \$6,000 per week in direct operating expenses.
- Westinghouse cited a 90 percent reduction in time spent tracing shipments. (Hermens, 1991)

More accurate records result from elimination of duplicate data entry efforts. When using EDI technology, data move from computer to computer. A major freight carrier indicated that one trading partner transmitted 600,000 freight bills using EDI over an 18 month span virtually error free (DLA Partnership, 1991, p. 12). In addition to greater accuracy, another major benefit is lower data entry cost.

Reduction in inventory levels for both users and suppliers is made possible by faster processing of orders and Electronic-Point-of-Sale (EPOS) data collection capability to coordinate reorders and determine production runs. This EPOS capability is especially prevalent in the retail/grocery

industry where some vendors utilize EPOS data to perform inventory management (stock reorder) responsibilities for their customers.

Decreased handling and mailing costs are another primary consideration in determining EDI savings. The accumulated cost of typing an order, making necessary copies of supporting information, addressing an envelope, and postage, all become expensive, especially when dealing with a large volume. The additional costs of overnight delivery for urgent requirements can be eliminated by using EDI transactions.

According to a DoD small business EDI Guide, (DLA Partnership, 1991, p.15) in financial management applications, a payee using the 820 [Remittance/Payment Advice] transaction set can apply cash to an invoice number. The benefit of this is that one individual check or EFT transaction paying hundreds of invoices and posting of payment information by the recipient is done in minutes rather than hours if done manually.

Customer satisfaction results from greater accuracy and faster deliveries. An overall benefit of EDI is that it enables managers to act on information with greater accuracy. The entire realm of operating a business appears to be enhanced by more current and accurate information concerning sales/orders, inventories, shipment status, payment data and cash flow are only a few of the areas enhanced through use of an EDI based business systems.

G. DEPARTMENT OF DEFENSE BENEFITS

Virtually all of the benefits cited for the commercial sector are applicable to DoD activities using EDI. Prior to discussing additional benefits of EDI applications in DoD, a brief discussion of DoD's contracts volume is in order. Figure 4 illustrates that 98 percent of all DoD procurement actions in FY 1990 were under the small purchase threshold of \$25,000, yet account for only 10 percent of the contract dollars awarded.

Typically the small purchase actions average just over \$1,000 per action. This large volume of small purchase actions is the basis for the DMRD 941 savings.

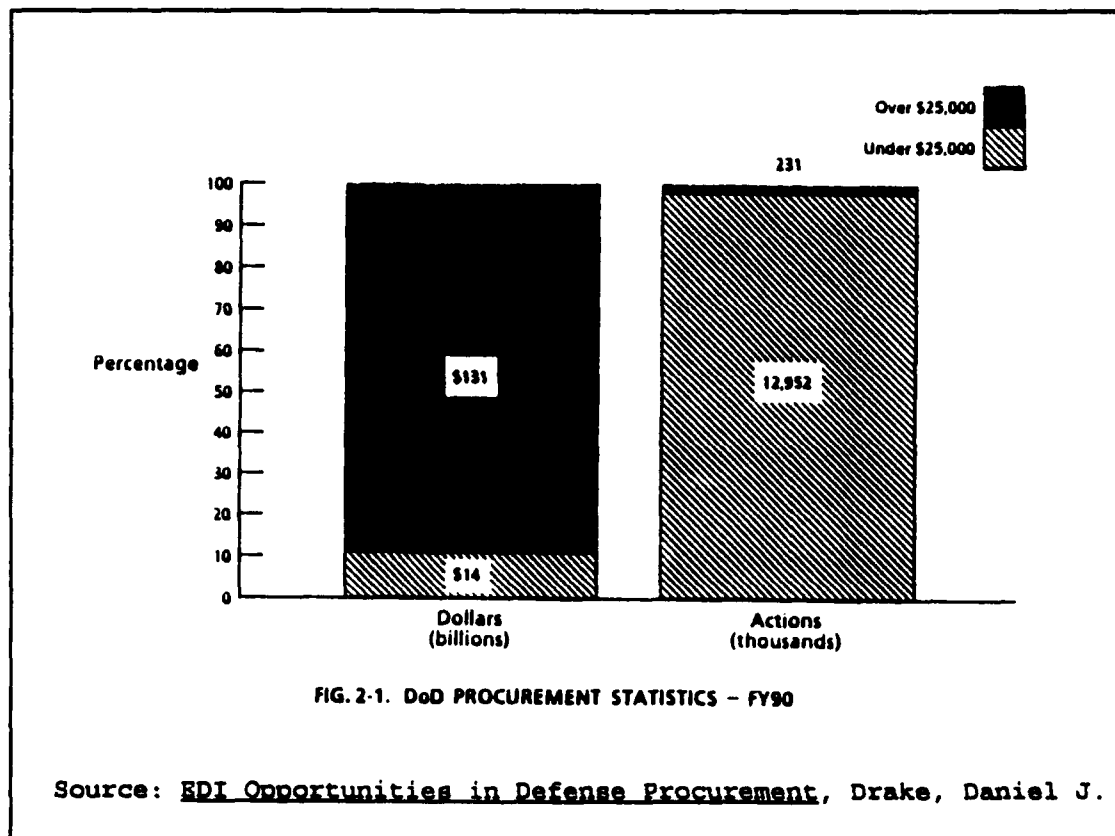


Figure 4. DoD Procurement Statistics -- FY90

The higher dollar contracts which account for only two percent of the volume follows the more formal contract requirements required by the Competition in Contracting Act (CICA). The bulk of these large contracts are for major weapon systems acquisitions; other categories include repairable components and service contracts.

As with the private sector, there are several important benefits to be gained through use of EDI. A reduction in data entry effort by elimination of repetitive entries results in a reduced clerical workload, drastically reduces the potential for errors through data entry, and potential manpower savings.

Improved responsiveness to customers is an expected benefit for DoD activities. Two reasons cited for this are: (a) increased opportunity to concentrate on problem issues and procurements, and (b) standardization of the method for communicating with all trading partners.

Department of Defense EDI advocates indicate the use of electronic bulletin boards for solicitation and request for quotation interactions may enable an increase in the level of small business participation in DoD procurement. This EDI application may also result in a drastic reduction in paper handling and duplicating costs for procurement activities. Other benefits expected in DoD are reduced stocking levels through use of direct vendor deliveries and reduced order and shipping times for stocked items. Other expected DoD benefits include improvement in error detection during data input,

improvements in extracting and reporting of statistical procurement data (DD Form 350), and the ability to exchange and reconcile data between systems, (e.g. procurement - contract administration - transportation - and payment functions).

H. SUMMARY

This chapter introduces the concept and history of EDI utilization. Electronic Data Interchange is the computer-to-computer or application-to-application exchange of business documents using a standard electronic format. The use of DoD and commercial EDI applications in proprietary formats emerged in the early 1960s. The sanctioning of the Accredited Standards Committee X12 (ASC X12) by ANSI in 1979 marked the beginning of an aggressive effort to evolve many proprietary EDI systems into a single standard. The DoD (Taft 1988) is a strong advocate of EDI and in 1991 additional emphasis was placed on EDI use by DMRD 941. The direct and indirect benefits of EDI covers a wide range of factors, from processing and mailing costs, time, inventory reductions, and greater customer satisfaction.

The next chapter will introduce the reader to EDI applications being used or under development within the U.S. Navy and Defense Logistics Agency.

III. ELECTRONIC DATA INTERCHANGE PROGRAMS

The Navy has many Electronic Data Interchange (EDI) initiatives implemented, partially implemented or under development. This chapter presents an overview of Navy EDI initiatives and also includes an overview of several EDI procurement programs within the Defense Logistics Agency (DLA). Navy EDI programs in other logistics areas are discussed to emphasize the flexibility and variety of EDI transaction sets.⁷

A. NAVY ELECTRONIC DATA INTERCHANGE PROGRAM MANAGEMENT OFFICE

The Navy EDI Program Management Office (PMO) established a foundation for Navy-wide EDI implementation strategy. The PMO provides start-up funding for many EDI initiatives and coordinates Navy-wide EDI efforts to encourage independent projects, capitalize on successful EDI efforts and guard against redundant initiatives. It is important to note that once mapping of an existing transaction (e.g., DD 1155 purchase order) is completed, that effort can be used by any activity with a similar application. This is the basis for

⁷The EDI program overviews in this chapter were developed through the following: telephone interviews, interviews during site visits to several Navy and DLA activities, the U.S. Navy EDI/CALS workshop presented by the Navy EDI and CALS program office, and literature review.

the PMO emphasis to avoid redundancy in developing applications while at the same time encouraging independent projects.

B. NAVY PROCUREMENT SYSTEMS

Two procurement systems support automation requirements at Navy Inventory Control Points (Naval Aviation Supply Office and Ships Parts Control Center) and major activities in the Navy Field Contracting System. Inventory Control Points are supported by the Integrated Technical Item Management and Procurement (ITIMP) System which integrates inventory management and procurement functions. In the Navy Field Contracting System, Automation of Procurement and Accounting Data (APADE) supports 25 of the larger sites in CONUS and overseas locations.

1. Automated Purchase Systems

In addition to the purchase order (DD 1155), DMRD 941 (1991) Procurement/Contract Administration savings will be achieved using the following transaction sets:

- SF 18 will be replaced with the 840 [(Request for Quotation (RFQ))] and 843 [Response to RFQ].
- SF 30 will be replaced with the following ASC X12 transaction sets: 860 [Purchase Order Change Request from Buyer], 865 [Purchase Order Change Request from Seller], and the 850 [Purchase Order].
- SF 129 Solicitation Mailing List. This is an excellent candidate, however no applicable ASC X12 transaction set is available.

- DD 250 Material Inspection and Receiving Report (and Invoice) will be replaced by the ASC X12 transaction sets 810 [Invoice], 856 [Ship Notice/Manifest], 861 [Receiving Advice/Acceptance Certificate], and 863 [Report of Test Results].
- SF 1443 Contractor Request for Progress Payment. The request, approval, and payment can be done by EDI/EFT. Applicable ASC X12 transaction sets are 810 [Invoice], 820 [Payment Advice].⁸

a. Navy Inventory Control Points

The Naval Aviation Supply Office (ASO) developed and implemented an EDI purchasing application using the ASC X12 850 [Purchase Order] for the ITIMP system. The ASC X12 850 [Purchase Order] is used to issue purchase orders and to place orders against basic ordering agreements (BOA). The ASO is currently transmitting the ASC X12 850 [Purchase Order] to approximately 25 suppliers and receiving the ASC X12 977 [Functional Acknowledgment]. The initial goal in ASO's EDI initiative is to establish an EDI trading partner relationship with their top 30 suppliers representing approximately 75 percent of the purchasing volume. The use of EDI transactions at Navy ICPs is limited by the ITIMP systems inability to accept and process incoming EDI transactions without manual intervention. This is the most important capability being developed for the ITIMP system by the Fleet Material Support Office.

⁸The ASO is also providing a paper copy of purchase orders to suppliers to satisfy the FAR requirements.

The Fleet Material Support Office (FMSO) functions as the Central Design Agency (CDA) for the ITIMP system and is tasked by NAVSUPSYSCOM to work with ASO and SPCC to develop the 840 [RFQ], and 843 [Response to RFQ] capability for the ITIMP system. This effort will also incorporate the ASO's developmental effort on the ASC X12 850 [Purchase Order] and provide an expanded EDI capability for the ITIMP system, especially in the area of competitive buys. The ASO is currently using a transaction set provided by the Commerce Business Daily (CBD) to transmit daily synopsis information to the CBD. In the contract administration and payment area, the ASC X12 820 [Payment Order/Remittance Advice] is used to certify invoices to be paid locally by ASO (five to ten percent of ASO's total volume). According to ASO's Procurement Support Division Director, the ITIMP system will ultimately incorporate the full range of EDI transaction sets identified in DMRD 941 for the procurement/contract administration functions. (Prendergast, 1992)

In addition to the EDI transaction sets identified in DMRD 941, the ASO intends to implement the ASC X12 832 [Price/Sales Catalog] transaction set on an ASO-resident, trading partner-maintained data base, and the ASC X12 841 [Specification/Technical Information] transaction sets. The use of EDI transactions for contract types requiring any significant amount of technical data or drawings is limited. Overcoming the limited capability to transmit technical data

and drawings contained in bid sets may be nearing reality. This is the result of ongoing industry research and development efforts in data compression and communication capabilities (Prendergast, 1992).

Figure 5 provides an illustration of the potential EDI cycle in the entire procurement process. Important to note in Figure 5 is the numerous activities receiving the various EDI transaction sets (previously paper copies). For example, copies of the 850 [Purchase Order] are required by the contractor, contracting activity, receiving activity, payment activity, authorized accounting activity (AAA), and the contract administration office.

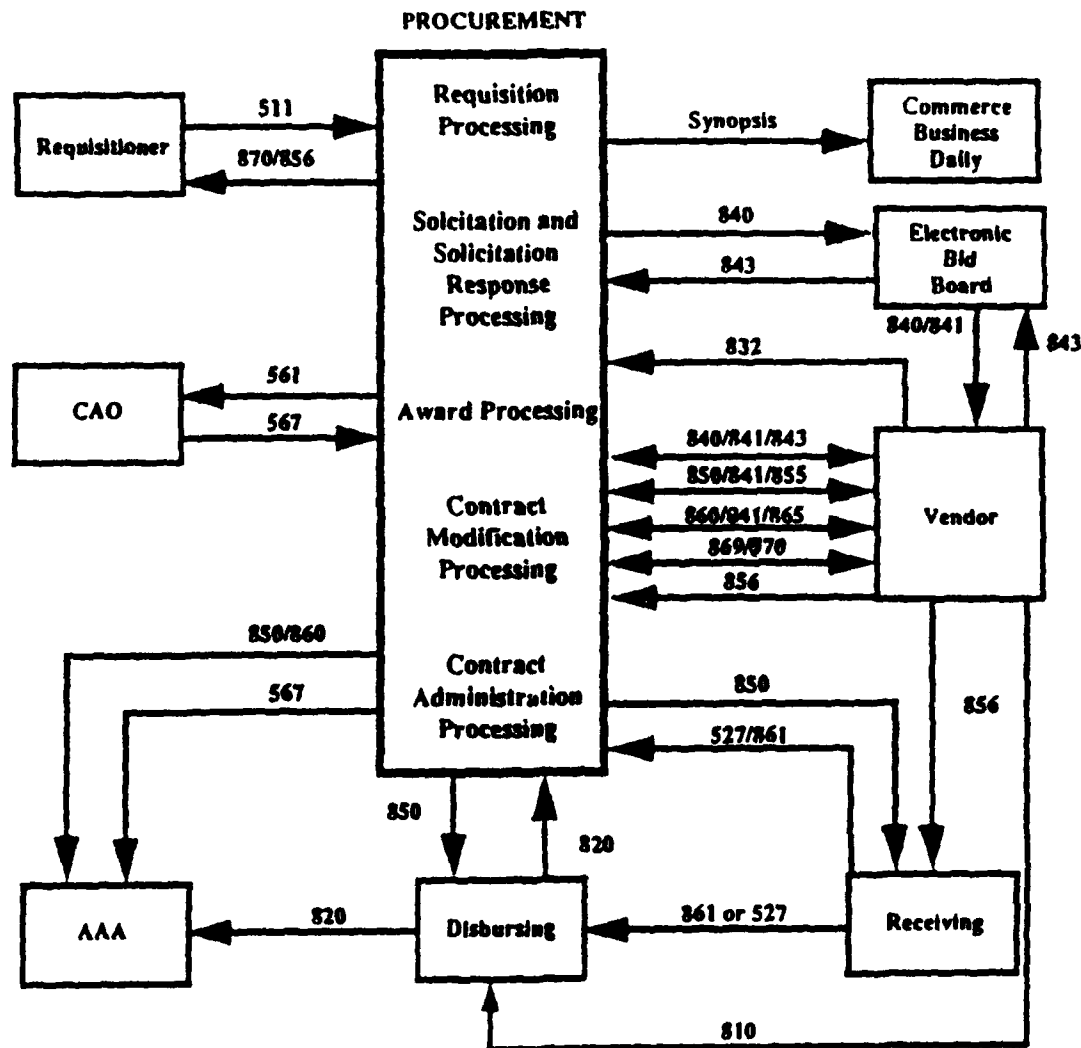
Information provided at the Navy EDI/CALS Workshop (1992) indicated that ASO and SPCC large and small purchase actions in one year required nearly one million copies of contracts, with a total of nearly 20 million pages produced. The cost to produce, sort and mail this volume of paper is phenomenal.

b. Navy Field Contracting System

The Automation of Procurement and Accounting Data Entry (APADE) system supports 25 activities in the Navy Field Contracting System (NFCS).

The APADE system is a standardized procurement data processing system designed to provide document control, management and buyer support information, automated document preparation, and interdependent system support to selected offices in the NFCS. (APADE, 1992)

PROCUREMENT EDI/EC ENVIRONMENT



Source: Navy EDI/CALS Workshop

Figure 5 Procurement Cycle EDI Process

Approximately 96 percent of the procurement volume for APADE sites is for the various types of small purchase actions. (Navy EDI/CALS Workshop, 1992)

The FMSO has responsibility as the APADE CDA and is currently developing an EDI capability for release to APADE sites. The initial EDI transaction set application being released to the APADE sites is the 850 [Purchase Order] for use in placing blanket purchase order (BPA) calls. Until the Federal Acquisition Regulation (FAR) is modified to include the use of electronic signatures, the NAVSUPSYSCOM is restricting the use of EDI in APADE to actions not requiring a signature.⁹ The use of EDI for BPA calls recently completed a successful field test at NSC Charleston. The EDI capability for the APADE system will interface with an ASC X12 compliant version of the Electronically Assisted Solicitation Exchange system (discussed in the following section). Full release of this initial EDI capability to all APADE sites is expected following receipt of policy guidance from the NAVSUPSYSCOM.

Future enhancements to the APADE system EDI capability will eventually include large and small purchase applications such as competitive procurements, purchase

⁹This also presents a problem with the ITIMP system. Until the FAR is modified, the ASO is providing paper copies of procurement documents for all EDI purchase orders.

The legal impediments and other barriers to EDI are discussed in chapter IV.

orders, BOAs, delivery orders against competitively established indefinite delivery contracts such as General Service Administration (GSA) and Federal Supply Schedules (FSS). A major enhancement to the APADE system centers around the conversion of the Electronically Assisted Solicitation Exchange (EASE) to ASC X12 standards and full integration with the APADE system. The present APADE system accepts input from the Uniform Automated Data Processing (UDAPS) at some shore activities. This capability will be expanded to a larger variety of activities with the use of an EDI transaction set.

2. Electronic Assisted Solicitation Exchange

Electronic Assisted Solicitation Exchange (EASE) is a microcomputer (PC) based "interactive exchange" medium accessible through a national commercial network. The system has multiple features that posts small purchase (under \$25,000) RFQs. The EASE extracts data from RFQs prepared by APADE in a tailored file via a commercial network. By accessing EASE, vendors are able to review RFQs from any of the sites using EASE: download desired RFQs and transmit a RFQ response back to the applicable EASE site. The quotes received electronically are automatically posted to the APADE system. Buyers are able to process and make an award decision the following day. The EASE is a NAVSUPSYSCOM sponsored project developed by NSC Jacksonville. There are currently

four activities using EASE: NSC Jacksonville, NSC Charleston, NSC San Diego, and NSC Puget.

There are many benefits to an EASE-type system (Navy EDI/CALS Workshop, 1992). Enhanced buyer productivity will be achieved in several areas including reduced telephone effort, potential to receive numerous quotes increases competition, and identification of potential new sources of supply. Previously, small purchase vendors were typically from a small geographic area. Using EASE, the potential vendor base expands to cover a much greater area. The use of EASE avoids the requirement to rotate business among vendors. The level of competition can increase without additional effort on the buyer's part.

As presently configured, the EASE does not use ASC X12 standards. Improvements are in process to bring the EASE system into compliance with ASC X12 standards. The EASE system enhancements will also allow non-APADE interface, and expansion of the EASE system to procurement sites not currently using APADE.

3. Standard Accounting and Reporting System (STARS)/ STARS Electronic Processing System (SEPS)

The contract payment process is an integral part of the procurement cycle that includes both contractor progress payments and completed payments.

The STARS initiative is a Data Base Management Accounting and Accounts Payable system in use by the Navy

Regional Finance Center (NRFC), Washington [(now under Defense Finance and Accounting Service (DFAS))]. The STARS supports a variety of Washington, D.C. area procurement activities. The SEPS initiative is a pilot project sponsored by the NAVSUPSYSCOM, Office of the Chief of Naval Research, and NRFC, Washington, D.C.

Under the SEPS concept, a fully electronic system of contracting, invoicing, and payment is envisioned. The goal of SEPS is to include the use of EDI and EFT to improve accuracy and response times within the STARS system, and reduce or eliminate the large volume of paper documents.

The following objectives of STARS/SEP were presented during a system brief at the Navy EDI CALS Workshop.

- Electronic distribution of contract obligation data.
- Electronic distribution of contract modifications.
- Electronic distribution of expenditure information for reconciliation purposes.
- Electronic communication of vendor invoice data to the STARS system at NRFC, Washington, D.C.
- Electronic distribution of payments through the Federal Reserve System.
- Electronic communication of payment remittance advice by STARS to vendors.

Security measures for SEPS require greater attention than existing paper transactions. Security measures incorporated into SEPS are:

- Electronic authentication to detect unauthorized interception and modification of certification data during transmissions
- A verifiable electronic signature to validate and confirm the invoice approval authority of individual contracting offices. (NAVSUP EDI Plan, 1991, p. 3-3)

An electronic signature system called EDILOC requires that each authorized Administrative Contracting Officer (ACO) have a private signature code. The SEPS system will not permit an ACO to transmit an approved invoice if their electronic signature is not found in an encrypted signature file. A brief description of the electronic signature as described in the NAVSUP EDI Plan (1991, p. 3-3) follows:

An encrypted version of the electronic signature is attached to the transaction set, an authentication code is automatically generated, and the code is encrypted and transmitted with the signature. The authentication code helps detect any unauthorized modification to the electronic signature or the document to which the signature is attached.

An added benefit of these security measures is their applicability to other EDI projects especially in the area of alleviating concerns over signatures on certain types of contracts.

The following ASC X12 transaction sets identified in the NAVSUPSYSCOM SEPS (1991, p.9) Master Plan will be used in the SEPS initiative:

- ASC X12 850 Purchase Order
- ASC X12 856 Ship Notice and Manifest (Used to satisfy DD 250 procedures and payment certification requirements).

- ASC X12 810 Invoice. Used for Payment requests, payment certification and abbreviated return notification of results of invoice processing, i.e., Accepted or Rejected for payment.
- ASC X12 820 Remittance Advice. Detailed payment information in EDI format to Vendor and/or to the Federal Reserve Bank.
- T-SET 989 An X12 compatible transaction set to support the Navy's electronic signature system (EDILOC).
- ASC X12 994 Administrative Message for communication of operational information and technical notes to participants. This transaction set is compatible with WordPerfect 5.0 and 5.1.
- ASC X12 997 Functional Acknowledgement of an EDI transmission.

4. Contractor Cost and Schedule Reporting

A project is under development for Navy Weapon Systems Program Management Offices to transmit Cost Schedule Control Systems data between the project office, prime contractor, and subcontractors. (NAVSUP ASDP, 1992, p.8) ASC X12 has developed the 806 [Project Schedule Reporting] and 839 [Project Cost Reporting] transaction sets for this application.

5. Contractor Cost Data Reporting

The Naval Air Systems Command (NAVAIRSYSCOM) Cost Analysis Group is developing a proposed ASC X12 transaction set (196) [Contractor Cost Data Reporting] (Lamatrice, 1992). This transaction set is being developed around the

requirements for data in the following series of forms:

DD Form 1921	Cost Data Summary Report
DD Form 1921-1	Functional Cost Hour Report
DD Form 1921-2	Progress Curve Report
DD Form 1921-3	Plant-Wide Data Report

The proposed ASC X12 196 transaction set would be used to support contractor reporting requirements for major acquisition data reporting requirements between the Government and prime contractors, and between prime contractors and subcontractors. This would include recurring and non-recurring costs reported by work breakdown structure and functional cost categories. Also included is progress or learning curve information detailing unit or average unit cost information by functional cost category, and summary contractor business base information such as indirect expenses, rates, and resources available. The proposed ASC X12 196 [Contractor Cost Data Reporting] transaction set will enhance the ability of PMOs for Navy weapon systems to determine actual costs associated with contracts for both research and development (R&D), and production programs. According to NAVAIRSYSCOM personnel involved, the proposed ASC X12 196 transaction set will be used to convey proposed, initial, progress, updated, and final contract cost information. (Lamatrice, 1992)

The NAVAIRSYSCOM intends to use the proposed ASC X12 196 transaction set with their "INGRIS" Management Information

System. The proposed ASC X12 196 transaction set could be exported and incorporated in other Weapon Systems Commands, PMO Management Information Systems

6. Modernization of Defense Logistics Standard Systems

Under the Modernization of Defense Logistics Standard Systems (MODELS), the Navy is working with the Defense Logistics Standard Systems Division (DLSSD) in DLA and the other Services to convert existing logistics related transactions to ASC X12 standards. This initiative is discussed in more detail in Chapter II and Appendix D.

7. Material Inspection and Receiving Report (DD 250) Pilot Project

The DD 250 is a versatile form and is widely used by contractors and Government to document material inspection, acceptance, shipment, and receipt. It is also used for a variety of situations not specifically related to contracts. Depending on contractor preference, the DD 250 may also serve as an invoice. Various EDI projects deal in part with the DD 250 (e.g., SEPS and transportation related projects). A pilot project to convert the various versions of the DD 250 is sponsored by the Defense Contract Management Area Operations Office (DCMAO) at Kirtland Air Force Base, New Mexico (now part of DFAS) (NAVSUP EDI Plan, 1991, p. 3-4). Many private sector organizations and DoD activities are participating in this effort (including NRFC Washington, DC). The DD 250

project is an integral part of the STARS/SEPS initiative to process progress payments and invoices using EDI and EFT.

According to the NAVSUP ASDP (1991), there is a requirement to replace the DD 250 as a packing list by expanding bar-coded information on containers.

The additional information will promote integrated processing of contract-oriented (e.g., receipt acknowledgment, contract file update, etc.) and supply-oriented files. By replacing other instances of the DD 250 with EDI, we can obtain contractor shipment data electronically, better manage asset visibility of in-transit material and improve the matching of depot material receipts to specific contract line items. (NAVSUP ASDP, 1991, p.9)

This effort is expanding and is included in several other efforts including, Advanced Traceability and Control - Plus, (ATAC+), Conventional Ammunition Integrated Management System (CAIMS), and Customer Complaint Report of Discrepancy (CC ROD). These three areas are discussed in subsequent sections. Two of the most common EDI transaction sets used to support this initiative are the ASC X12 810 [Invoice], ASC X12 856 [Ship Notice and Manifest], ASC X12 861 [Receiving Advice/Acceptance Certificate] and the ASC X12 863 [Report of Test Results].

8. Government Bill of Lading (GBL)

Shipping activities creating and processing GBLs have varying levels of automation. NAVSUPSYSCOM is sponsoring a pilot project to allow large shipping activities and

commercial carriers to exchange the following ASC X12 transaction sets: 856 [Ship Notice/Manifest] and 858 [Shipment Information] with the Navy Material Transportation Office (NAVMTO) in Norfolk, VA. The initial project involves transmission of GBL data from a Naval Supply Center to the NAVMTO data base using the Navy Logistics Net (NLN) communications network.

Future plans are for carriers to receive EDI GBLs from shipping activities and subsequently forward electronic invoices to NAVMTO for certification and payment by EFT. Other related initiatives in this area are Prepayment auditing of vendor invoices and transmission of shipment tracing information between shippers and carriers.

9. Rapid Acquisition of Manufactured Parts (RAMP)

The Rapid Acquisition of Manufactured Parts (RAMP) is a Computer-aided Acquisition and Logistics Support (CALS) compliant initiative. The RAMP program uses computer integrated manufacturing technology to reduce cost and procurement lead-time in manufacturing small quantities of high quality parts (Navy EDI/CALS Workshop, 1992).

RAMP will allow vendors to produce selected classes of spare parts on demand. This technology is consistent with the Computer-aided Acquisition and Logistics Support (CALS) program and is driven by the electronic part data standard, Product Data Exchange Using Standard for the Exchange of Product Model Data (PDES). PDES provides an unambiguous, digital definition of a part to communicate precise instructions to robotics and other automated

equipment that can manufacture the part. (NAVSUP ASDP, 1991, p. 10)

The RAMP program will utilize several EDI transactions sets. The ASC X12 840 [RFQ] and 843 [Response to RFQ] will establish a relationship between the customer (Inventory Control Point) and the manufacturer (RAMP) site. The ASC X12 841 [Specifications/Technical Information] transaction set is used to transfer the PDES data. Additional transaction sets are used to purchase/requisition material for the manufacturing process and track overall project status.

10. Naval Air Warfare Center Weapons Division China Lake

The Naval Air Warfare Center Weapons Division China Lake has developed an EDI program for small purchase application. The program is called, **Small Purchase Electronic Data Interchange (SPEDI)**, is derived from a Department of Energy program and was redeveloped for local use.

Materials purchased using SPEDI are primarily office supplies and computer peripherals available from indefinite delivery contracts with two vendors. This program is unique in that approximately 400 ordering officers throughout the command are authorized to place orders against the two indefinite delivery contracts. Ordering officers use existing computer terminals to access SPEDI using part numbers and key words. Vendors access the SPEDI system and download orders several times daily. Actual deliveries to customers are by command delivery personnel with proof of delivery accomplished

by using a portable bar-code scanner to scan bar-coded information on the receipt document and scanning the ID badge of the receiver. The SPEDI system does not use ASC X12 transaction sets, however the researcher was informed that conversion to ASC X12 standards was an eventual objective.

C. NAVY LOGISTICS SYSTEMS

The use of EDI technology along with the improvements being developed under the MODELS initiative will result in significant changes to existing logistics systems.

1. Shipboard Non-Tactical Automated Data Processing (SNAP) III Material Management System

SNAP III is a project to upgrade the existing afloat material management and financial systems. This extensive modernization effort to upgrade existing shipboard hardware and software will take place throughout the 1990s. The SNAP III upgrade will provide the interface for the shipboard environment into the DLMS system and utilize the full range of DoD applicable ASC X12 EDI transaction sets. (NAVSUP ASDP, 1991, p. 10)

2. Customer Complaint Report of Discrepancy (CC ROD)

The existing Report of Discrepancy process is manually intensive, error prone, and time consuming. The ultimate goal of CC ROD is to use the ASC X12 842 [Non-conformance Report] to transmit data from a customer PC based outgoing ROD program to the Uniform Automated Data Processing System (UDAPS)

incoming program. Providing customer status and responses is an additional capability in the CC ROD program. The modifications should eliminate several delays now associated with filling out forms, mailing them and retyping the information into the Automatic Report of Discrepancy (AUTOROD) data base (NAVSUP EDI Plan, 1991, p. 3-6).

3. Conventional Ammunition Integrated Management System Project (CAIMS)

The Navy is evaluating a project to upgrade the wholesale and retail ammunition management systems to support features of the DLMS. In addition to CAIMS, Navy ammunition management includes the several other automated systems to support world-wide inventory management and reporting. The intent of the pilot project is to consolidate all standard and nonstandard receipt, issue, referral, and reporting transactions used by the ammunition community into a series of ASC X12 transactions sets supporting all supplemental data requirements (e.g., serial/lot numbers). (NAVSUP EDI Plan, 1991, p. 3-5)

According to FMSO personnel involved in the CAIMS program, the transaction sets planned for use support two functions:

- **Transaction Item Reporting (TIR), and Serial/Lot Items Tracking (SLIT).** The ASC X12 transaction sets used will be 527 [Material Due-in/Receipt], 532 [Issue, Backorder and Demand], and 533 [Inventory Adjustment].

- **Requisition and Referrals.** The ASC X12 transaction sets used will be 511 [Requisition], 514 [Requisition Status], 516 [Material Release], and 518 [Passing, Referral and Redistribution Order]

4. Advanced Traceability and Control -- Plus (ATAC+) and Satellite Alternative Logistics Transmission System (SALTS)

The ATAC+ project is sponsored by NAVSUPSYSCOM to provide a major improvement to the existing Depot Level Repairable (DLR) retrograde tracking system. ATAC+ will provide in-transit visibility (ITV) from point of turn-in until receipt at the designated overhaul point. The ATAC+ initiative will capitalize on transportation industry EDI initiatives. Initially the shipboard aviation assets will benefit and follow-on expansion will include the surface community assets. The following paragraph from the NAVSUPSYSCOM Strategic Plan (1991, p. 3-6) provides an example of the communications network and material tracking system to be utilized.

The improvements will provide a much needed capability to track and expedite DLR retrograde shipments on a real-time basis from time of turn-in to a shipboard supply department through receipt at the designated organic or contractor overhaul point¹⁰. The system will make use of international marine satellite (INMARSAT) telecommunications hardware; integrate information contained in the National Transportation System data base with information maintained in the ATAC system, Contractor Aviation Material Management System (CAMMS), and Contractor Asset Visibility (CAV) data bases; and convert

¹⁰This concept is similar to how package carriers e.g., Federal Express or United Parcel Service, maintain visibility over commercial packages.

all DLMS, non-DLMS, and paper transactions to a series of EDI transactions. SALTS is a similar capability developed by ASO during Operation Desert Storm to transmit logistics information via satellite. SALTS is being evaluated for possible use in the ATAC system.

The ATAC+ project will use a variety of ASC X12 transaction sets including the 527 [Material Receipt], 856 [Ship Notice/Manifest] and 861 [Receiving Advice/Acceptance Certificate].

D. DEFENSE LOGISTICS AGENCY ELECTRONIC DATA INTERCHANGE IN PROCUREMENT

The Defense Logistics Agency Inventory Control Points use an integrated system similar to the Navy ICPs. The DLA system, called Standard Automated Material Management System (SAMMS), is presently used at all DLA supply centers with the exception of Defense Fuel Supply Center (DFSC). The DLA has many EDI related projects currently in use or under development.

The primary procurement related EDI program in DLA is SAMMS Procurement by Electronic Data Exchange (SPEDE).¹¹ The SPEDE program is designed to electronically exchange requests for quotations, quotations, purchase orders, and invoices between vendors and DLA supply centers. DLA developed the SPEDE system and provides SPEDE software to

¹¹The DLA program SPEDE and the China Lake program SPEDI are not related programs.

participating vendor sites for installation on IBM-compatible microcomputers.

At participating DLA supply centers, SAMMS downloads purchase requests to SPEDE at the end of each workday. The SPEDE system determines the vendors involved in the transactions and transmits that day's purchase orders, requests for quotations, and award information to the appropriate vendors. Following submission of a vendor quotation, the applicable DLA purchasing office provides, through SPEDE, a purchase order or a notice of the vendor receiving the award and the price.

According to DLA personnel interviewed, the existing communication method limits expanded participation in SPEDE, although improvements are planned. Under the current process, daily transactions are sent via a "dial up system". The applicable DLA supply center computer calls each vendor's computer via modem and commercial telephone lines to send and receive EDI transactions.

There are two applications in SPEDE:

- SPEDE I is used primarily with blanket purchase authority (BPA) type small purchases. An ASC X12 850 [Purchase Order] is sent to a vendor's computer; if the price stated is acceptable, the vendor responds with an ASC X12 855 [Purchase Order Acknowledgement].
- SPEDE II is intended for use in competitive procurements and uses RFQs, purchase orders, and invoices. An ASC X12 840 [RFQ] is sent to as many as 12 suppliers who respond with the ASC X12 [Response to RFQ]. SPEDE evaluates the quotations and issues an ASC X12 850 [Purchase Order].

Both versions of SPEDE provide suppliers with an electronic invoicing capability.

1. Defense Industrial Supply Center (DISC)

The Defense Industrial Supply Center (DISC) in Philadelphia, Pennsylvania has an EDI initiative using the SPEDE II for buying various types of bulk metal products. This initiative called SPEDE/STEEL uses selected NSNs for bulk metal products. Participating customers were requested to waive source inspection of bulk metal products given that vendors provide quality evidence with each delivery. Prices for each vendor were preestablished for each type of bulk metal product based on a price per pound (regardless of size). Customer requisitions are transmitted to vendors using a rotating bid list.

The DISC found that suppliers were able to meet drastically reduced delivery times. With the average being approximately 25 days compared to between 200 and 300 days if the item is not-in-stock. The volume of STEEL requirements led to use of an EDI solution. Using STEEL the DISC sends a customer (e.g., Naval Ship Yard) requisition to SPEDE-II which transmits an electronic award notice to the vendor. The vendor confirms the order and provides a shipping notice. Following shipment the vendor transmits an invoice to SPEDE II and when the receipt confirmation is received from the customer the payment is made via EFT.

SPEDE/STEEL has limitations, however the process is simple and complies with ASC X12 Standards. Two problems with the SPEDE/STEEL are: lack of a transaction set for overseas shipments, and no capability to receive unsolicited quotes. (Ralph, 1992)

In addition to the reduced receipt time there were other impacts with the STEEL program. There was a 20 percent (approximately) increase in competition. The overhead and surcharge for items on SPEDE/STEEL was reduced to approximately 18 percent as compared to 49 percent for most DISC managed items. Because of smaller quantity buys, the average price per item went up slightly. However in terms of material availability, reduced warehouse stock, less handling costs, avoidance of inspection requirements, there are many savings. (Ralph, 1992)

2. Defense Personnel Support Center (DPSC)

The DPSC Medical Directorate is using SPEDE for direct vendor delivery (DVD) of medical items. Initially started for the DVD of medical items to DLA stock points, this initiative expanded to enable DVD to customers, primarily military hospitals. There are many benefits cited for using SPEDE-Medical (Roberts, 1992):

- Reduced depot stock resulting in savings in warehouse space, handling, and avoidance of second destination shipping expenses.
- Reduced disposal of shelf-life material in stock.

- Reduced local purchase requirements for individual hospitals.
- Improved availability and response times.
- Large reduction in numbers of individual activities billed by medical vendors.

The SPEDE system is receiving a positive response from vendors. As reported in a 1991 study by the National Defense Institute for the Assistant Secretary of Defense (Production and Logistics) the SPEDE system at DPSC was favorably received by vendors. Positive benefits cited were, ability to receive and respond to RFQs, improved accuracy over phone quotes, and faster overall process. (Payne, 1991, p. 37-38) In another study, by the Logistics Management Institute (Drake, EDI Opportunities, 1992, p. 3-4), the SPEDE-Medical competitive small purchase module was described as:

...the most advanced and promising EDI procurement application we have found. It has fully complied with ANSI X12 standards and has demonstrated procurement efficiency while stimulating competition, lowering prices, and providing small businesses with automated order/quotation tools. It is more than an order processing system.

3. Paperless Ordering Placement System (POPS)

The Defense General Supply Center (DGSC) is using the Paperless Order Placement System (POPS) to purchase supply items with storage/handling problems and/or limited shelf life (e.g., photographic film). An important criteria on POPS orders was the type of item that could be supplied directly from a contractor's distribution channel. The DGSC applied

EDI concepts to indefinite delivery contracts to obtain rapid delivery via participating contractors' commercial distribution systems. (DRAKE, 1990, p. 3-6) In addition to improved customer response times, DGSC was able to make significant reductions in inventory levels resulting in reduced write offs for overage inventory, repackaging of items and additional transportation charges. Contracts under POPS are typically competitively placed indefinite delivery contracts with major suppliers. The criteria for selecting an item for POPS are (DRAKE, 1990, p. 3-4):

- significant demand history
- availability of commercial distribution channels
- opportunities to reduce inventory, warehousing, and transport costs.
- existence of suppliers willing to respond to electronic orders

E. AREAS FOR EXPANDED UTILIZATION OF EDI APPLICATIONS

There are many existing EDI initiatives relating to specific projects. The NAVSUPSYSCOM has identified the following future EDI requirements to help improve current projects in the acquisition and contracting areas. (NAVSUP EDI Plan, 1991, p. 3-8)

- Expand the range of transaction sets used in the acquisition process at ICPs and major regional acquisition offices (APADE sites).

- Replace the SF 1211 [Pricing Proposal] with the ASC X12 805 transaction set.
- Replace use of the DD 250 as a packing list by expanding bar-coded information of containers. The additional information will promote integrated processing of contract-oriented files (e.g., receipt acknowledgment, contract file update, etc.).
- Expand the use of EDI replacements for the DD 250. Obtain contractor shipment data to better manage asset visibility of in-transit material and improve the matching of depot material receipts to specific contract line items.
- Expand the use of bulletin board-like capability throughout the acquisition process.
- Provide an EDI alternative for the DD 350 "Report of Contracting Actions Over \$25,000."¹²
- Expand SEPS participation and export EFT to other payment systems where feasible.
- Expand, where appropriate, invoice certification and electronic signature authorizations within the Navy to permit electronic processing of documents.

The above list includes many individual projects that will enhance the small purchase process. To gain the maximum benefit from EDI capability, the entire realm of EDI interactions previously depicted in Figure 5 will be used. Achievement of this goal will require increased emphasis on establishing standard EDI interfaces with the Defense Finance and Accounting Service (DFAS) payment activities and contract administration offices within the Defense Contract Management Command (DCMC).

¹²The DD 350 information would be extracted from the ITIMP and APADE systems.

The emphasis on EDI in procurement functions centers primarily on small purchase (under \$25,000) applications. The ease of use, type of commodity bought and highly repetitive nature of the process lends itself to rapid implementation and payback. The use of EDI transactions in competitive procurements (greater than \$25,000) offers greater challenges. These challenges are primarily in the technical aspects such as electronic solicitations, legal restrictions and security.

Developmental work on capabilities to transmit large amounts of technical data and engineering drawings is being pursued as part of the DoD Computer-aided Acquisition and Logistic Support (CALS) program. The CALS program is a DoD and industry strategy to address creation, management, and use of technical information for design, manufacture, and support of weapon systems. The core goal of CALS is to create data once and use it many times. (NAVY EDI/CALS Workshop, 1992) An overview of CALS is provided in Appendix (E).

In another aspect of using EDI in competitive procurements, a recent Logistics Management Institute report (DRAKE, 1991, p. 3-1) indicated that in FY 1990, 40 percent of large-purchase actions were delivery orders under large contracts. Various types of procurement methods such as competitively established indefinite delivery contracts and sole source basic ordering agreements would continue to be established using existing procedures. At this point the same

benefits found in using EDI transactions to placing delivery orders with small purchases are realized.

F. SUMMARY

The Navy has an aggressive EDI plan to achieve the savings identified in DMRD 941. At the present time, applications of EDI in procurement are focused on the high volume requirements of the small purchase area, delivery orders against established contracts, and orders under existing Basic Ordering Agreements. The Navy is also expanding the use of EDI capability to many logistics applications.

The next chapter introduces the reader to several current issues in the implementation of EDI. These areas are: legal and regulatory impediments, security issues, and small business participation.

IV. ELECTRONIC DATA INTERCHANGE IMPLEMENTATION ISSUES

There are several issues surrounding the full implementation of EDI technology that are sometimes perceived as barriers to implementation. These are legal and regulatory impediments, security, and small business concerns. The intent of this chapter is not to explore these three issues in great detail, but to present what appears to be the significant factors.

A. LEGAL/REGULATORY IMPEDIMENTS

Uniform acquisition policies and procedures for Federal Government agencies (including DoD) are set down through the Federal Acquisition Regulation (FAR). While the DoD and other Government agencies have initiated many Electronic Commerce (EC) projects, the FAR does not recognize current EDI capabilities as an accepted means of doing business in the contracting field. (Drake, EC Impediments, 1992 p. 2-2)

There is belief by some Government agencies that Federal rules of evidence require hard-copy contract documents to support potential legal actions. Drake (EC Impediments, 1992 p. 2-3) indicates this caution is considered by most sources as unwarranted. The reason being that, for the purpose of Federal rules of evidence, electronic records are essentially

the same as for paper records provided adequate security and control are maintained.

The Government's historical guidance on using standardized forms, written signatures, and paper storage methods for documents was based on the realities and practices of the time. Technological improvements in document storage capabilities as well as transmission and security capabilities now provide the same or increased level of control and security as previous methods. A 1991 legal memorandum opinion from the GAO (COMP GEN May, 1991) provides additional support that EDI documents meet the statutory requirement of 31 U.S.C. 1501:

Although the types of contracts formed using EDI are stored in a different manner than those of paper and ink contracts, they ultimately take the form of visual symbols. We believe that it is sensible to interpret federal law in a manner to accommodate technological advancements unless the law by its own terms expressly precludes such an interpretation, or sound policy reasons exist to do otherwise. *It is evident that EDI technology had not been conceived nor, probably, was even anticipated at the times section 1501 and the statutory definition of "writing" were enacted. Nevertheless, we believe that, given the legislative history of section 1501 and expansive definition of writing, section 1501 and 1 U.S.C. Sec 1 encompass EDI technology.* (GAO, B-238449, 1991)

In a recent legal opinion concerning electronic contracting, the GAO (B-238449, 1991) stated:

The Federal Government contract formation does not require a written document and that contracts may use electronic signatures to signify the contracting parties' intent to contract.

The Comptroller General (B-245714, 1991) provides additional support for electronic commerce, specifically in signature requirements. The Digest and Decision are provided:

Digest -- Contracts formed using Electronic Data Interchange technologies may constitute valid obligations of the government for purposes of 31 U.S.C. 1501, so long as the technology used provides the same degree of assurance and certainty as traditional "paper and ink" methods of contract formation.

Decision -- By letter dated September 13, 1991, the Director, Computer Systems Laboratory (CSL), National Institute of Standards and Technology (NIST), asked whether Federal agencies can use Electronic Data Interchange (EDI) technologies, such as message authentication codes and digital signatures, to create valid contractual obligations that can be recorded consistent with 31 U.S.C. 1501. For the reasons stated... we conclude that agencies can create valid obligations using properly secured EDI systems.

The GAO's acceptance of electronic business methods is not incorporated into the numerous procurement, contract administration, financial management, transportation and supply regulations and procedures that guide day-to-day business activities within DoD. (Drake, EC Impediments, 1992) Changes to the FAR and DFARS (Defense FAR Supplement) are required in the entire range of procurement functions from solicitation to award to contract administration and payment of invoices to accommodate EC technology.

Appendix A of the LMI Report, *Electronic Commerce: Removing Regulatory Impediments* (EC Impediments, 1992), discusses in great detail the flow of selected business information between the DoD and contractors, as well as among

DoD activities. This appendix also indicates the purpose of each information flow, changes required to replace paper documents with electronic transmission, and suggests modifications to regulations. In Appendix B of the same report LMI report, Drake provides detailed recommended changes to the FAR and DFARS.

The Defense Acquisition Regulation (DAR) Council is in the process of reviewing and drafting changes to the FAR to accommodate EC initiatives and incorporate the existing guidance from recent COMP GEN decisions and GAO interpretation of Federal code revisions.

Some procurement actions do not require signature or hard-copy forms. A typical example is blanket purchase agreement (BPA) calls. For these, EDI can be implemented without any problem regardless of FAR interpretation. Thus some activities are placing EDI delivery orders for small purchase requirements (under \$25,000) against various types of indefinite and definite delivery type contracts. Other activities are placing EDI delivery orders against multi-year requirements contracts, and basic ordering agreements.

B. SECURITY ISSUES

A Computer Systems Laboratory (CSL) bulletin on Computer Systems Technology (CSL, June, 1991, p. 3) provides concise guidance on a number of broad EDI security requirements that should be satisfied. These include:

- **Message Integrity.** The transmitting trading partner must ensure all critical information transmitted is unchanged when received by another trading partner.
- **Confidentiality.** Trading partners must restrict access to EDI messages that contain personal, trade-secret, or sensitive data.
- **Originator authentication.** The receiving trading partner must have reasonable assurance that the EDI message was transmitted by the named originator.
- **Non-Repudiation.** The trading partner establishing the EDI system must develop procedures to ensure that a binding proposal (such as a bid) submitted by any of its trading partners cannot be denied.
- **Availability.** Contingency plans should be developed to protect important data in the event of a system failure or degradation.

Of these five areas, the subject of originator authentication appears to have the greatest implication throughout the procurement cycle from award to receipt documents to invoice certification and to payment. For an electronic signature to be enforceable, an appropriate level of assurance must be in place to authenticate the originator's identity. According to Drake (EC Impediments, 1992, p. 3-4), basic controls for electronic signatures must:

- be unique to the signer
- be capable of verification
- be under the signer's control
- be linked to the data being sent

Simple signature techniques are based on identification and password security where an individual's authorization to

perform or approve certain actions is granted by a specific level of access. Evidence of an action is recorded against that individual's user identification. Signature requirements above the common method of identification and password may be met through the use of digital signature devices available commercially. Two common encryption techniques to protect sensitive EDI information are Message Authentication Code (MAC) and Public Key Cryptography (PKC).

1. Message Authentication Code

According to Drake (August, 1992 p. 5-5), with Message Authentication Code (MAC) technology,

...both the sending and receiving trading partners have secret encryption/description keys. The electronic transmission and the sender's key are entered into a sophisticated algorithm called the Data Encryption Standard (DES), which is located between the EDI translation software and the telecommunications software. The DES creates a special authentication code that is unique to a particular message and key combination. The code is appended to the message and transmitted with the key to the receiver. The receiving trading partner breaks off the authentication code (the transmitted MAC) and runs the message and keys back through the DES, which generates a second code. This code is then compared to the transmitted code. If they are identical, then the message has not been altered. The only way that the message could be tampered with is to recreate the key by generating the correct combination on the first attempt.

2. Public-Key Cryptography

Public-Key Cryptography (PKC) uses a series of complex algorithms in conjunction with two keys. In an article

dealing with PKC, Schneir (1992) summarizes the idea behind PKC:

Public-Key cryptography (PKC), could restore some of the individual privacy and security that has been lost to the evolving technologies of the electronic age. PKC is a system that uses two keys. One of the keys is public and the other is private, and it is not possible to deduce a private key from a public one. A person with the public key can encrypt a message, but only someone with a private key can decrypt it. PKC algorithms are complex and are therefore not well suited to encrypting long messages, but PKC can be used to send the key for a different cryptographic algorithm, which is then used to encrypt and decrypt messages. The Digital Encryption Standard (DES) is used this way. PKC implies possibilities of security arrangements not otherwise attainable.

According to Drake (EC Impediments, 1992, p. 3-4) this type of system would have the following benefits:

- It requires no ongoing business relationship between sender and receiver.
- It allows signatures and authorizations to be proven at a future time.
- It secures co-signatories and counter signatures.
- It eliminates the burden of administering a secret key system.

C. SMALL BUSINESS

One area of concern regarding EDI utilization is the ability of the small business community to participate. Approximately 98 percent of all DoD procurement actions are for small purchase requirements (under \$25,000) and most of this volume involves small businesses. (Drake, EDI

Opportunities, 1992, p. 2-4) This concern for ability to participate proved to be unfounded. Responses received during the researcher's contact with various activities indicated the use of EDI along with an electronic solicitation capability is expected to enhance the level of participation and competition among small businesses.

In 1990, a study on small business participation in DoD EDI initiatives was funded by the DoD EDI Executive Agent. The objective of the study (Dynamic Technology, 1990) which utilized a base of 500 randomly selected small businesses who dealt with DLA supply centers was to:

- Assess current small business participation in DoD procurements.
- Assess current and predict future EDI capabilities among DoD small business trading partners.
- Provide insight on small business desires, interests, and needs in order to increase participation in DoD EDI implementation.

With responses received from over 200 DoD small businesses, the Dynamic Technology (1990) study concluded that:

- Small businesses provide approximately one-half of all products and services purchased by the DoD supply centers.
- Approximately 67 percent of small businesses possess the basic EDI technical expertise and equipment necessary to receive and respond to RFQs using standard EDI technology.
- DoD small business trading partners are eager to receive the additional information, education and training

necessary to enhance their participation in DoD EDI implementation.

- Future small business participation in EDI implementation will be directly proportionate to DoD-sponsored education and training of its trading partners.

Based on the above conclusions, the Dynamic Technology (1990) study recommended to the DoD EDI Executive Agent to:

- Expedite the development of a comprehensive EDI awareness program which would concurrently target the small business vendor base.
- Team with the Small Business Administration (SBA) as a vehicle for disseminating DoD information concerning participation on EDI implementation.
- Establish an incentive program for EDI participants.

Understandably, the general range of EDI benefits identified in Chapter II, and provided below for review, are equally applicable to small businesses:

- Fewer errors in data entry.
- Elimination of mailing costs.
- Reduction of paperwork.
- Improved delivery response and payment.
- Increased opportunities for Government business.

These last two areas were frequently provided by EDI users as areas for the greatest potential for small business. This is especially important when considering that faster payment results in improved cash flow/management, an area of concern to all businesses, small and large.

Barriers for small business entry in EDI are not considered large. The Dynamic Technology (1990) study reported 67 percent of DoD small vendors surveyed possess some type of computer capabilities. The initial expenses to become EDI capable are routinely quoted by several EDI users as under \$1,000 for a commercial EDI translation and communication program, and initial VAN access.

The DoD actively encourages participation in EDI initiatives by small business concerns. In addition to establishing a partnership with the SBA, the DoD has published a detailed and informative handbook for small business titled "Forging a Partnership Through EDI."

D. SUMMARY

This chapter presents three of the widely recognized EDI implementation issues which are, legal/regulatory, security, and small business. The legal/regulatory and security concerns are being addressed by various organizations involved. The use of EDI in procurement applications is expected to have a positive impact on the small business base.

The next chapter provides an analysis of findings. The findings and analysis consists of two sections; the first dealing with factors contributing to EDI implementation, the second covers lessons learned in implementing EDI applications.

V. ANALYSIS OF FINDINGS

The discussion on current and future Navy EDI applications in Chapter III provides a large portion of the research findings. The researcher found a greater number of EDI applications than was anticipated prior to conducting the research.

During interviews and discussions with EDI practitioners, a high level of interest and enthusiasm was observed. The general spirit appeared to be one of an involvement in changes that will have a large impact on the existing business process. Most of the Navy EDI applications are relatively new or being implemented. This chapter will concentrate on factors contributing to the success of EDI, and barriers to EDI planning and implementation.

A. ANALYSIS OF FINDINGS

Interviews and discussions on EDI were conducted with a variety of personnel with varying levels of responsibility and involvement in EDI. This variety was intended to provide the researcher with a wide perspective of Navy EDI applications.

A statistical or quantitative analysis of interview responses was not attempted nor desired. This is primarily due to the non-structured interview method and differing levels of involvement and responsibility for EDI programs of

those interviewed. During the interview process several areas evolved as common ground among those interviewed. These areas along with others that are particularly beneficial are discussed in the following sections.

1. Contributing Factors

It was observed that many of the perceived barriers could be more accurately described as factors that slowed down EDI implementation. The most significant is the lack of specific guidance in the FAR concerning the use of EDI capability. As discussed in Chapter IV, proposed changes to the FAR are being drafted, however specific information as to when the FAR changes will be issued was unknown to interviewees. For most Navy procurement activities, this restricts the current use of EDI to small purchases such as Blanket Purchase Agreements with no signature or hard-copy requirements. As previously discussed in Chapter III, some Navy activities are using EDI purchase orders for a wider range of contract types, however these are followed up with an official hard-copy.

The following discusses areas considered to be barriers or issues in implementing EDI programs in the contracting applications and includes the researcher's analysis:

a. Integration with Contract Administration and Finance (payment and accounting) Activities

Aside from the legal and regulatory impediments, this area was identified by many interviewees as the most significant barrier to the full integration of EDI in the procurement process. The interviewees referred to ongoing efforts at a higher level (headquarters and DCMC/DFAS) to integrate these areas over the next few years. The concern centers on how fast full implementation of the enhancements will be made.

A large part of the savings in EDI are realized by eliminating redundant entry of business data. Figure 5 in Chapter III shows the interrelationships and document flows in the typical procurement process. Using the DD Form 1155 (Purchase Order) as an example, it was the researcher's observation that full EDI capability and utilization in the entire procurement process is required to achieve the significant savings mandated by DMRD 941. The Navy's SEPS initiative for finance and payment functions serves as an example of integrating the procurement and contract administration process. The activity responsible for SEPS (NRFC, Washington D.C.) is now part of Defense Finance and Accounting Service (DFAS) however, SEPS will continue to be used by those activities involved until similar DFAS systems are developed.

b. Security of RFQ Responses and EDI Transactions in General

Security of RFQ responses and EDI transactions in general was discussed as an initial area of concern by interviewees. This was described by those activities without experience using commercial VANs for communication of EDI transactions. This same concern is also addressed by both DoD and industry EDI literature in terms of how security concerns are being satisfied. The primary concern mentioned was the potential for transactions to be misrouted to other than the intended individual. While this is a valid concern, and widely addressed in the EDI literature by both users and VAN service suppliers, none of the interviewees reported personal knowledge of any specific security problems resulting from EDI transactions.

Based on literature review and interviews, it is the researcher's conclusion that the security procedures provided by VAN services are adequate to preclude misrouted EDI transactions. Depending on the EDI transaction set used, varying levels of security are desired. For instance, an EDI invoice certification transaction requires a greater level of security than that expected for a purchase order. Electronic signatures and EDI message encryption techniques under development by industry and DoD will provide necessary levels of security when required.

c. Communication With Trading Partners

During interviews, an additional method of providing security for EDI communications mentioned by several interviewees was the use of a "Dial Out" system from computer-to-computer. There were mixed feelings among the interviewees concerning the "Dial Out" system. This researcher found that some activities determined this was a security enhancement because of the direct communication path. Other activities cited potential security problems with the "Dial Out" process to a large number of other computers.

Some activities using computer-to-computer ("Dial Out") communication are reporting difficulties with the volume of EDI transactions as trading partner participation increases. These activities indicated they were switching to a VAN service or were seriously considering it.

It was the researcher's observation during site visits that a "Dial Out" system is time consuming and requires unnecessary oversight, especially in the event any number of trading partners are not on-line when the "Call" is made. The use of a VAN with message holding capability (Electronic mail box) appears to be the solution to this concern. This capability could also reduce concerns for time-zone differences when communicating with overseas activities and suppliers.

d. Capability of Existing Automated Procurement Systems

Automated procurement systems, such as APADE and ITIMP, require extensive modifications to enable interaction with EDI trading partners. This area is mentioned as a barrier to full EDI implementation primarily because of the length of time and funding required to re-engineer existing automated systems. The researcher observed a wide understanding among interviewees that, extensive re-engineering of automated procurement systems will be required as well as many logistics applications.

A specific example of modifying existing automated procurement systems discussed by several Navy interviewees was the lack of basic transaction sets such as the 840 and 843 [RFQ and Response to RFQ]. Several interviewees indicated the ongoing effort between FMSO, Navy ICPs, and the NFCS to incorporate these transaction sets and others (see Appendix F) with existing systems in 1993 will provide a significant enhancement in EDI capability. The DLA plans to enhance the current capability of the SPEDE system with the implementation of the entire range of transaction sets indicated in Appendix F by the end of 1993. (Cooley, 1993)

In Volume I of the Logistics Management Institute study, *MODELS, Modernization of Defense Logistics Systems*, Egan (1991) indicates many years will be required to fully complete the re-engineering of automated systems. The

flexibility designed into the MODELS initiative is an example of how DoD plans to interface with existing DLSS applications during the re-engineering process.

The DoD is actively reviewing automated systems in all areas throughout the Services and DLA. (Prendergast, 1992) Selection of the Navy ITIMP system as the DoD standard for Inventory Control Points is an example of the level of interest in consolidating like applications in an effort to reduce redundant systems.

e. Adding New Trading Partners

The level of effort required to bring new EDI trading partners on-line can be extensive. Several activities reported that a considerable level of effort was often required to establish the EDI link with existing suppliers. Based on comments made by interviewees at most activities, this appeared to be an issue of supplier unfamiliarity with EDI procedures rather than resistance or other problems. As an example, one interviewee at a DLA Supply center stated that "trying to add too many suppliers as EDI trading partners at one time is difficult." This activity had established an EDI trading partner relationship with approximately 56 of their top 100 suppliers. They were adding from two to five new suppliers each month and because of the differing level of involvement with each supplier, felt it would be difficult to handle more than that per month.

The DoD EDI Implementation Guide (DLA, 1991) indicates that training of suppliers is not the responsibility of DoD activities. There appears to be a difference between policy and practice concerning this issue. It is a logical conclusion that when implementing new technology there will be questions and problems. While it is not reasonable to expect DoD activities to "teach" suppliers the details of EDI, a reasonable level of effort to establish an EDI communication link with suppliers should be accepted. While this initial level of effort may be considerable, the benefits to be gained by helping suppliers establish the EDI link far outweigh any concerns for DoD activities providing assistance.

While "heavy" involvement with suppliers is often required during EDI implementation, this was considered by most of the interviewees as a necessary effort to ensure a successful EDI relationship. The issue is presented as an awareness or "time" factor rather than an actual barrier to implementation.

f. Transmission of Technical Data Packages

The lack of capability to transmit technical data packages (TDP) was identified by interviewees as a limiting factor in applying EDI capability to various contract types. This is a concern for the procurement of other than standard items such as those with a TDP containing detailed specifications and engineering drawings.

The 841 [Specifications/ Technical Information] transaction set is available for this purpose, however due primarily to technical restrictions this is not a widely used option. An example of this is the inordinate amount of time that would be required to transmit an engineering drawing or schematic. Ongoing research and technological developments in data compression and communication technology, combined with CALS initiatives, will lead to enhanced capabilities in this area. [Navy EDI/CALS Workshop, 1992] This capability will enable Navy ICPs to expand the use of EDI to procurement of additional categories of material. Development of this capability is also a key factor in utilization of the 841 [Specifications/ Technical Information] transaction set in the major weapon systems acquisition environment.

g. International Standards

The DoD is committed to supporting the ANSI ASC X12 EDI standards. Recent discussion in available EDI literature indicates that experts in the field predict the two EDI standards (ASC X12 and EDIFACT) will evolve into one common international standard by the late 1990s. Several interviewees expressed a valid concern that the DoD must continue to be involved in this merger process to protect the investment currently being made to re-engineer existing automated procurement system. The concerns of the interviewees are echoed by much of the EDI literature over the

eventual merger of the two major EDI standards. For this reason, compatibility with the ASC X12 standards must be maintained with all DoD systems as the evolution of ASC X12 and EDIFACT into a common standard takes place.

2. Lessons Learned

Many valuable lessons learned from the EDI implementation process were discussed during the interviews. The lessons learned reveal a wide range of factors contributing to success in implementing initial EDI projects. Two significant lessons learned were reported by a majority of those interviewed. These two areas are: **command support** and **functional area participation**. The following section identifies and discusses lessons learned in implementing EDI programs for contracting applications.

a. Command Support

It was the researcher's observation that there was a universal concurrence among interviewees that command support is a primary factor in the success of EDI projects thus far. The most often cited examples were, visible top management commitment to EDI initiatives, funding and personnel resources, and providing assistance lobbying external activities for support.

The critical aspects of management involvement and support are recognized factors when implementing new concepts. A recent example supporting this thought is the implementation

of Total Quality Management (TQM) in the Navy over the past several years. A significant reason why TQM implementations are more successful than many management initiatives seen in the past is, the level of commitment and involvement from top management. This concept is especially important for an initiative such as EDI because of the level of involvement required from within numerous functional areas, internal and external to an activity.

b. Functional Area Participation

Varying levels of functional area participation in EDI initiatives were observed during site visits. Inclusion of all functional areas involved in the contracting process was noted as key to "everyone involved buying into the EDI project." Examples of functional areas involved were procurement, small business office, legal, transportation, inventory management, quality assurance and management support. One individual did acknowledge that minimal involvement from all areas involved early in the process may have slowed the initial implementation of EDI projects at their activity. This same individual did indicate that progress improved considerably when the functional and technical areas began working together.

Here again the issue of participation can be related to TQM. Part of the TQM philosophy is user involvement in identifying, describing and improving

processes. When dealing with EDI, this should include all functional areas impacted by the EDI implementation. It is the researcher's observation that this TQM principle is significant considering the range of impact on current procedures, wide level of involvement, and the considerable technical issues involved.

c. Learning Curve and Shared Experiences

When implementing EDI, there is an initial level of expertise that must be acquired in EDI concepts and applications. Methods of acquiring this level of expertise varied and included formal training, seminars, EDI conferences, on the job training, independent research, and networking with individuals at other activities. The Navy EDI Project Management Office (PMO) is centrally funding a large portion of the initial EDI training. This training ranges from introductory workshops to detailed instructions on mapping transaction sets to specific applications.

It is the researcher's opinion that, the current policy of central funding for training and PMO approved initiatives provides an incentive to new and existing participants in EDI applications. Another example is the training provided to personnel at DPSC by a contractor. (Roberts, 1992) This training served to expose large numbers of employees, representing a wide spectrum of functional areas, to the basic concepts of EDI.

Most management textbooks reveal that a major obstacle toward implementing change in organizations is apprehension of the "unknown". It is this researcher's experience in other situations that, eliminating this apprehension through the various types of training offered, is a significant step taken to create a positive and receptive environment for implementing EDI applications.

"Find someone who has done it (EDI) and use their experience." This quote from one of the interviewees was directed primarily toward individual interactions with another EDI user. Expanding on this idea are the numerous EDI user groups that have been organized in many locations. These groups include DoD and industry specific groups, and groups with a combination of both. Industry and professional associations such as the Aerospace Industries Association (AIA) and the National Contract Management Association (NCMA) are active participants in promoting the use of EDI. Both of these organizations have sponsored EDI related conferences in the past year to promote EDI, provide a forum for networking among EDI users to exchange ideas, and increase the level of knowledge about EDI. In addition to sharing lessons learned, EDI user groups are generating new ideas, and serve as advocates for advancing EDI applications.

d. "Philadelphia EDI Consortium"

The "Philadelphia Consortium" consists of several Philadelphia area DoD activities (ASO, DPSC, DISC, and Navy Regional Contracting Center (NRCC), Philadelphia). The purpose of the "Philadelphia Consortium" is to promote the use of EDI, exchange ideas on current and future initiatives, and make recommendations for improvement to the entire EDI process. One such recommendation from the group is a proposed joint letter from the Philadelphia area DoD activities to both the DFAS and DCMC headquarters emphasizing the need to accelerate the establishment of standard interfaces for EDI interaction throughout the entire procurement process.

The "Philadelphia Consortium" is essentially a small EDI user group sharing ideas and joining efforts to expand and improve upon the utilization of EDI. A consolidated effort and position on an issue concerning EDI is a strategy that can serve to raise concerns to appropriate levels. It is the researcher's observation that DoD activities cannot provide the full cycle of EDI transactions to industry until EDI capability is provided throughout the entire business cycle. This concern, which is discussed in the following section, brings up the question; At what point should DoD mandate the use of EDI for suppliers?

e. Mandating Supplier Participation in Electronic Data Interchange

"Encourage but don't force suppliers to participate." There was a general consensus that most of the high volume purchasing in the future will be done using EDI. In answering the question, the feelings were mixed and several comments were received indicating that the Government should not mandate the use of EDI with suppliers until a more complete cycle of transactions can be provided.

A more complete cycle of transactions as defined by the interviewees refers primarily to the lack of standardized interfaces in the contract administration and finance areas. Also cited is the current inability to exchange other than the basic ASC X12 transaction sets. It is the researcher's conclusion that the additional EDI transaction sets planned for implementation during 1993 in systems such as the Navy's APADE and ITIMP, and DLA's SPEDE will enable a greater level of participation by suppliers. While the issue of mandating supplier use of EDI is not specifically addressed in DoD guidance, it is only reasonable to expect that as the use of EDI continues to expand, those suppliers unwilling to participate may find themselves at a competitive disadvantage in the future.

f. Electronic Data Interchanged Symposiums for Suppliers

Events such as EDI symposiums for suppliers are well-suited to educating and gaining support of current and potential EDI users and trading partners. An example of this was an "Electronic Commerce Symposium" hosted by ASO in June 1992. This symposium was attended by over 60 individuals representing approximately 10 DoD activities and 20 suppliers. Topics of discussion included a review of ASO EDI program status and future EDI initiatives.

Symposiums for suppliers, like user groups, can provide a neutral environment for Government and suppliers to establish a dialogue to facilitate and promote the use of EDI. Considering that each DoD activity approaches EDI differently this interaction is an important source of information, new ideas and possible solutions to current problems.

g. Electronic Data Interchange Translation and Communication Software

A review of current EDI literature reveals a wide variety of EDI software products and services. It was observed that while software products for mainframe, mini and PC applications were being used, the variety of different vendor software actually in use for each computer application was minimal. Reasons given for selection of a particular vendor's software included ease of use, customer service support, and reliability. One of the interviewees indicated

that some form of Government evaluation of EDI software products to determine capability is required to assist users in selection. The researcher found several documents pertaining to the evaluation of EDI software, the most recent being a Logistics Management Institute study, *A Guide to EDI Translation Software, 1992 Edition*, (Frohman, January 1992, LMI Report PL205RD1)

h. Selection of Contract Type for High Volume Procurement Actions

Both the interview responses and literature review recognize the success and importance of using delivery orders against established contracts, BPAs, and BOAs in high volume EDI procurement applications. This is not a new concept, but simply an extension of EDI capability to enhance existing methods of contracting.

The Logistics Management Institute study, *Electronic Data Interchange Opportunities in Defense Procurement*, (Drake, May, 1992) identifies high volume procurement activities within DoD with potential for rapid payback on investment in EDI. The scope of this study included the many Defense Commissary Agency procurement offices and the entire range of the Services' procurement activities.

Based on volume alone, only three Naval Supply Center procurement activities were in the volume range

considered by the study as "large volume". (Drake, May, 1992, p. A-2) It is the researcher's observation that characterizing the types of activities with potential to achieve the largest savings through EDI should consist of evaluating the potential savings throughout the entire procurement process.

i. Communication with Foreign Suppliers

Electronic Data Interchange-FAX (EDI-FAX) is a capability being used to communicate with foreign suppliers. This is a service provided by one VAN to communicate with non-EDI capable suppliers or those utilizing a different standard than ANSI ASC X12, such as EDIFACT. One activity reported that this service was used to pass purchase orders to Original Equipment Manufacturers (OEM) in the European community. Software programs with the capability to translate between the ANSI ASC X12 and the EDIFACT standard are available. However, this is only a temporary remedy until the larger issue of, how the ANSI ASC X12 and EDIFACT standards will eventually merge over the next five or six years.

The concept of a "global economy" is one often discussed in several of the researcher's graduate courses. From the industry perspective it is often suggested that, "if a firm is not doing business internationally it is not competitive in today's market." On the DoD side of this issue, an increasing number of foreign suppliers are involved

in providing a wide range of components and consumable items in weapon systems. This also applies to a wide range of industries, not just those in the defense industrial base. The previous thought provides additional support for establishing a universal common EDI standard.

j. Electronic Data Interchange Implementation

The following quote is from an individual involved in the technical aspects of EDI implementation. "Start with a PC driven package and then migrate to a main-frame application to handle the total aspect. The advantage of starting with a PC package is that it is much easier to map and prototype new transactions....Pick translation software with the ability to take a flat file from the mainframe programs and pull it into the EDI application."

From the researcher's perception, the message in the previous quote is, not to try to implement the whole EDI solution at one time. As with any new development project, it is important to start with a manageable level and build upon successes. From another point of view, several interviewees indicated that trying to implement many new EDI transactions sets at one time is not a good practice primarily because of the potential for confusion among participants.

k. Public Relations

Wide dissemination of EDI successes and plans as well as training opportunities were cited by many of the

interviewees as key aspects of generating interest and gaining support for EDI initiatives.

Public relations is an important management tool used in implementing new projects and ideas. Techniques such as command and headquarters publications, as well as those within industry groups provide an excellent vehicle for publicizing EDI initiatives. This can provide activity personnel a feeling of satisfaction, helps build team spirit and also generates ideas for further initiatives by those within the activity or at other activities.

B. SUMMARY

This chapter presents the reader with a wide range of relevant factors to be considered and lessons learned during previous implementations of EDI. The chapter also represents what the researcher feels is a compilation of the experiences and opinions from approximately 20 individuals involved in implementing EDI projects. The key areas to consider in lessons learned, are the requirement for top management support and the various means to network and share ideas, successes, and problems in EDI implementations. For barriers to EDI implementation, the single most critical issue is removing the legal and regulatory impediments that currently restrict the full use of EDI in contracting applications.

The next chapter provides the researcher's conclusions and recommendations as well as identification of numerous areas of EDI in contracting applications requiring additional research.

VI. CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSIONS

The common definition of EDI frequently given is the "application-to-application exchange of business data in a standardized format". Achieving the large savings mandated by DMRD 941 will require integration of EDI capability into MIS applications throughout the entire procurement cycle.

Commercial concerns and the DoD have been using proprietary versions of EDI for nearly 30 years. Over the past ten years a considerable effort was made by numerous organizations to standardize the wide variety of EDI transactions. Appendix B provides an example of the variety of EDI transactions and level of involvement by both industry and Government. The standardization efforts, widespread availability of computer assets, and recent developments in data communication capability all are contributing to the rapid spread of EDI programs and initiatives.

To achieve the level of savings identified in DMRD 941 and other related productivity enhancing mandates, the DoD implemented an ambitious plan that will result in full implementation of EDI capability by 1996. The DLA is designated as the DoD Executive Agent for coordinating EDI development among the Services and DLA. The Naval Supply

Systems Command is designated as the Navy Project Management Office for coordination, promotion, and funding of Navy EDI initiatives.

Within the Navy, EDI initiatives involve a wide range of projects in procurement, finance, and logistics applications. Initial Navy EDI projects in procurement areas are geared toward actions using a variety of procurement methods available to handle the typically high volume of small purchase (under \$25,000), as well as actions using basic ordering agreements. Follow-on initiatives will expand into the more complex arena of large competitive contracts.

Modifications to Navy automated procurement systems are currently in progress to incorporate EDI capabilities with the APADE system for the Navy Field Contracting System and ITIMP which supports the two Navy Inventory Control Points. This is a combined effort involving personnel from both user and technical perspectives.

The enthusiasm and commitment to making EDI work is at very high level. This was evident during interviews, site visits, and during attendance at a two day Navy EDI/CALS Workshop. The feeling seems to be one of participation in an opportunity to make creative and positive improvements to existing business systems and processes.

There are several issues responsible for a considerable amount of concern in the EDI process. These are legal and regulatory impediments, security, and small business concerns.

Existing legal and regulatory impediments appear to present the most significant obstacle to full implementation of EDI projects. This concern stems primarily from the lack of any specific language in the Federal Acquisition Regulation allowing the use of EDI in the procurement process.

Aside from the legal and regulatory impediments, and possibly time factors, no other significant barriers to using EDI were identified. From the prospective of those interviewed, what might be labeled a barrier by some, was classified as factors to be considered rather than actual obstacles to implementation. A wide variety of EDI lessons learned were provided by interviewees throughout the interview process. Of these, the most significant appears to be the indispensability of high level support, the importance of involvement by functional areas impacted by EDI projects, and the need to share ideas among related activities.

B. RECOMMENDATIONS

The purpose of this thesis was to determine the current applications of EDI technology in U.S. Navy contracting activities, what barriers must be overcome to enhance utilization of EDI technology, and how to increase involvement in EDI initiatives. In dealing with the barriers to EDI and methods to enhance interest in EDI, the following recommendations are made:

1. That the Naval Supply Systems Command continue efforts to push for delivery of changes to the Federal Acquisition Regulation concerning the use of EDI. Most interviewees were aware of the initiative to revise the FAR concerning the use of EDI. These changes when received will have a significant impact on current procedures. However there seemed to be a feeling that changes would not be seen in the near future. For this reason, the current implementations of EDI must be based on interpretation of existing Federal codes and Comptroller General decisions relevant to EDI.

2. That the Navy continue to review and evaluate other Services' EDI applications to eliminate redundant efforts. The current trend in DoD appears to be one of consolidating similar functions. One relevant example of this is the selection of the Navy ITIMP system as the standard for DoD Inventory Control Points. Other systems such as APADE for the Navy Field Contracting System could potentially be faced with similar reviews and consolidation. While the evaluation and comparison of other Services' EDI initiatives is beyond the scope of this thesis, it should be noted that all Services have implemented uniform and nonredundant EDI programs.

3. That the Navy EDI Project Management Office (PMO) continue the high level of support and funding of EDI initiatives. The Navy EDI PMO is centrally funding much of the ongoing EDI training of both developers and users. This funding is part of the "seed" funding provided under DMRD 941.

The ability to fund new EDI projects was found to be a significant factor in the high level of interest among EDI users and should be continued.

4. That the Naval Supply Systems Command continue the active support and involvement to integrate EDI interactions in the entire range of contracting processes. In order for the Navy to achieve the savings mandated by DMRD 941, ongoing efforts to create and enhance EDI links between the contracting activities and the contract administration and finance functions must be aggressively pursued.

C. RESEARCH QUESTIONS

To answer the primary research question, the following subsidiary research questions were asked:

1. How is EDI being used in the private sector and within the Department of Defense? Chapter II discussed the background of EDI and traced the developmental history in the private sector and DoD.

2. What applications of EDI are presently in use at Navy contracting activities? There are numerous Navy EDI initiatives implemented or in the development stage. Chapter III identified current EDI initiatives in use at Navy contracting activities.

3. What are the future applications of EDI in the contracting area? Future EDI applications will include the interface with contract administration and finance functions

to further enhance the benefits of EDI. Expansion of EDI capabilities into the major weapon systems acquisition and project management areas will occur as interfaces are developed with contract administration and finance activities. Discussion of this question is included in Chapters III and V.

4. What problems or barriers exist to current and future uses of EDI in Navy contracting applications? Very few barriers to EDI uses were identified through the interviews. However, those identified were considered significant. These were legal and regulatory impediments and the lack of widespread interfaces with contract administration and finance functions. Discussion on these areas was included in Chapters IV and V.

5. What actions must be taken to enhance the use of EDI technology in the U.S. Navy? The high level of visibility given EDI by both the PMO and Navy activities currently using EDI applications provides a positive resource for interested activities to draw from. The single most important aspect gained during the interviews was the requirement to ensure all functional areas impacted are involved in planning and implementation of EDI programs from the start.

6. What is the relationship between Computer-aided Acquisition and Logistic Support (CALS) and Electronic Data Interchange? The CALS initiative deals with the creation, storage, and use of digital technical data in support of weapon systems programs and is discussed briefly in

Appendix E. The relationship between CALS and EDI is primarily in the context of using specific EDI transaction sets to exchange CALS data.

7. What are areas of further research for the use of EDI in contracting applications. Directions for further research are discussed in the following section.

D. DIRECTIONS FOR FURTHER RESEARCH

During the research and interview process, numerous areas for further research relating to the use of EDI in the contracting function were identified. These areas include:

- What level of EDI capability exists within the Defense Contract Management Command (DCMC)? How can EDI be fully implemented within the DCMC?
- What level of EDI capability exists within the Defense Accounting and Finance Service (DFAS)? How are the Navy EDI initiatives under the SEPS program being integrated into those of the DFAS? How can EDI be fully implemented within the DFAS?
- Electronic Funds Transfer (EFT) is a key element in Electronic Commerce. What level of EDI/EFT implementation exists or is planned within the many Government bill paying activities, particularly DFAS?
- The small business EDI survey (Dynamic Technology, 1990) cited in this thesis is approximately two years old. Conduct a similar survey with a wider range of questions to determine if the level of EDI capability, participation and interest has changed significantly.
- The Electronically Aided Solicitation Exchange (EASE) is being modified to comply with ASC X12 EDI standards. Will this initiative support both large and small purchases requirements? How can the EASE system be integrated with automated purchase systems other than APADE? What are the similar initiatives within the DoD and how does EASE compare to these?

- What would be the effect of DoD contracting activities mandating that suppliers use EDI? What is the impact on small business. Is this a reasonable expectation?
- What industries are leading in the EDI movement? Several interviewees indicated that EDI trading partners are simply printing a hard-copy of incoming EDI transactions and re-keying the data into their internal systems. What is the capability of industry to receive EDI transactions into an internal automated ordering or material management system?
- What are the non-Navy EDI initiatives throughout DoD? Conduct an analysis of capability and current level of implementation?
- Review the major systems acquisition process to determine the areas where EDI applications can have the greatest impact.
- The DLA Executive Agent and the Navy PMO for EDI published EDI Strategic Plans in late 1991. Are these plans still relevant? How is the status of EDI implementation, and level of success in achieving the DMRD savings being determined?
- The number of ANSI ASC X12 standards continues to increase. Given limited resources, which transactions provide the optimal business solutions in procurement activities?
- The 832 [Price Sales Catalog] provides on-line pricing capability. Are there any successful applications using this transaction with multiple suppliers?
- The Lawrence Livermore National Laboratory is funded by the DoD for EDI research in many of the technical areas especially communications and networking services. One of these research projects dealing with a DoD communication hub (VAN) is called the "Intelligent Gateway Processor". Conduct a review of this initiative and identify the impact of implementation.
- How are overseas contracting activities participating in EDI initiatives? Are there any plans to utilize EDI capabilities with suppliers in any overseas areas? What standard will be used, ANSI ASC X12 or EDIFACT?
- What EDI transactions are planned for transmission of data between overseas contracting activities and CONUS activities? An example of this is passing requirements to

CONUS procurement activities for further action and DD 350 contract data.

- What changes are required for full implementation of EDI capability with the APADE system? (or ITIMP) These initiatives involve various aspects from contracting knowledge as well as data communication technology. This is a potential area for a dual thesis with a student in the Computer Systems or Telecommunications curriculum.
- Develop a training guide for implementation of EDI at APADE sites.
- A recent study by the Logistics Management Institute (Drake, EDI Opportunities in Procurement, May 1992), identified the largest DoD contracting activities in terms of volume. Conduct a survey to determine the level of EDI capability at these actives identified in the study.
- The Logistics Management Institute (Hardcastle, 1992) published an *EDI Planning and Implementation Guide* for use by DoD activities. This publication provides guidance on planning and implementation of EDI programs as well as how to conduct a required economic analysis. Utilize the various worksheet examples provided in the report to develop a computer spreadsheet application to simplify the analysis.
- Will existing plans for planned EDI programs enhance competition or will some suppliers be left out? A comment was made during interviews that the use of multi-year contracts to place EDI delivery orders was being used by some activities to avoid competition. Conduct a survey and analyze the various contracting types currently in use or planned for use with EDI contracting applications.
- Conduct an evaluation of existing EDI translation and communication software. Consider both those products currently in use at DoD activities and other products available on the market.

APPENDIX A
DEFINITIONS
LIST OF ABBREVIATIONS

ANSI	American National Standards Institute
APADE	Automation of Procurement and Accounting Data Entry
ASC	Accredited Standards Committee
ATAC	Advanced Traceability and Control
AUTOROD	Automated Report of Discrepancy
BBS	Bulletin Board System (Electronic)
CAIMS	Conventional Ammunition Integrated Management System
CALS	Computer-aided Acquisition and Logistic Support
CBD	<i>Commerce business Daily</i>
CDA	Central Design Agency
CIM	Corporate Information Management
CSCS	Cost Schedule Control Systems
DCMC	Defense Contract Management Command
DFARS	Defense Federal Acquisition Regulation Supplement
DLA	Defense Logistics Agency
DLMS	Defense Logistics Management System
DLSS	Defense Logistics Standard System
DMRD	Defense Management Review Decision
EASE	Electronic Assisted Solicitation Exchange

EC	Electronic Commerce
EDI	Electronic Data Interchange
EFT	Electronic Funds Transfer
FAR	Federal Acquisition Regulation
FMSO	Fleet material Support Office
GBL	Government Bill of Lading
ICP	Inventory Control Point
INMARSAT	International Marine Satellite
ITIMP	Integrated Technical Item Management Program
MILSBILLS	Military Standard Billing System
MILSCAP	Military Standard Contract Administration Procedures
MILSTAMP	Military Standard Transportation and Movement Procedures
MILSTRIP	Military Standard Requisitioning and Issue Procedures
MILSTRAP	Military Standard Transaction Reporting and Accounting Procedures
MODELS	Modernization of Defense Logistics Standard Systems
NRFC	Navy Regional Finance Center
POPS	Paperless Order System
RAMP	Rapid Acquisition of Manufactured Parts
RFQ	Request for Quotation
ROD	Report of Discrepancy
SALTS	Satellite Alternative Logistics Transmission System
SAMMS	Standard Automated Material Management System
VAN	Value Added Network

GLOSSARY

ANSI	American National Standards Institute. Coordinator and clearing house for information on national standards. Serves as the U.S. representative for the International Standards Organization. Chartered the ASC X12 committee to develop EDI standards. Exercises final approval of ASC X12 EDI standards.
ASC	Accredited Standards Committee. chartered by ANSI for the development of uniform EDI of business transactions.
ASC X12	Accredited Standards Committee X12. Comprises industry members who create EDI standards for submission to ANSI for subsequent approval and dissemination, or for submissions to the United Nations Standards Committee for approval of international EDIFACT standards (Featherstone, 1991).
data dictionary	A document that defines the specific content of each data element.
data element	The smallest unit of information in an EDI transaction set, such as price or nomenclature. Data elements are combined to make data segments.
data segment	A line of information in an EDI message. As an example, this compares to the shipping address in paper document.
EDI	Electronic Data Interchange. The application-to-application exchange of business data in a standard format.
EDIFACT	EDI for Administration, Commerce, and Trade. The international EDI standard format.
electronic mailbox	The place where an EDI transmission is stored electronically for pickup of delivery within a third-party service provider's system (VAN).

Executive Agent	The Defense Logistics Agency is designated the Executive Agent for EDI by the Assistant Secretary of Defense (Production and Logistics). The EA has responsibility for implementing EDI throughout the DoD.
flat file	A computer file used to transfer information between computer programs. Fixed-length (flat) formats rather than the variable length formats used in ASC X12 and EDIFACT.
indirect cost savings	Cost savings made possible by changes in business practices through use of EDI. (e.g., inventory reductions)
mapping	Taking data from an activity-specific format and creating a reference to the standard EDI format.
proprietary EDI	EDI formats with a small range of use or to a specific group. An example of this is the series of Defense Logistics Standard Systems which have been utilizing a DoD specific EDI format since the early 1960s.
trading partner	A customer, service provider, supplier, conducting business with a DoD, commercial or other organization.
transaction set	An EDI document typically consisting of a group of data segments forming a complete document. An example of this is a purchase order.
translation software	Software used to take data from an application flat file and convert it to the EDI standard format prior to transmission.
Value Added Network	Normally a commercial service provider that functions as a clearing house for EDI messages. Common services provided consist of electronic mail box, archival storage, and translation of data from one format to another. (Also called a third party network.)

Appendix B

Transaction Sets

This appendix lists all transaction sets included in the American National Standards Institute (ANSI) Accredited Standards Committee (ASC) document *X12 Electronic Data Interchange Standards, Draft Version 3 Release 2*. In addition to the approved standards, we have also listed those standards under development since both are of interest to the Department of Defense (DoD).

The first column in the table below contains the ASC X12 Transaction Set Identification Number. The second column contains the title of the transaction set. In the third column, we indicate any Defense Management Report Decision (DMRD) 941 forms that may apply to a specific transaction set. In some cases (such as Standard Form 1113, *Public Voucher*), a single DMRD 941 form may apply to more than one transaction set.

In the fourth column, we list other DoD documents, reports, and transactions that apply to the transaction sets. Modernization of Defense Logistics Systems (MODELS) transactions are highlighted by an underline in this column. More information on the content and structure of the ASC X12 transaction sets can be obtained by contacting:

ASC X12 Secretariat
Data Interchange Standards Association, Inc.
1800 Diagonal Road, Suite 355
Alexandria, VA 22314-2852
Phone: (703) 548-7005

ASC X12 Transaction Set ID	ASC X12 Standard Title	DMRD 941 Form	Other Uses
104	Air Shipment Information	SF 1113	<u>Material Returns</u> DD Form 1021
110	Air Freight Details and Invoice		
114	Air Ship Status Message		
170	Revenue Receipts Statement		
180 ^a	Revenue Receipts Statement		
198 ^b	Contractor Manufacturing Progress Reporting	SF 1113	
204	Motor Carrier Shipment Information		
210	Motor Carrier Freight Details and Invoice		
213	Motor Carrier Shipment Status Inquiry		
214	Motor Carrier Shipment Status Message		
217	Motor Carrier Loading and Route Guide		
218	Motor Carrier Tariff Information		
300	Reservation (Booking Request) (Ocean)		
301	Confirmation (Ocean)		

^a Not yet approved.

^b In development.

ASC X12 Transaction Set ID	ASC X12 Standard Title	DMRD 941 Form	Other Uses
303	Booking Cancellation (Ocean)	SF 1113	
304	Shipping Instructions (Ocean)		
309	U.S. Customs Manifest (Ocean)		
310	Freight Details and Invoice (Ocean)		
312	Arrival Notice (Ocean)		
313	Shipment Status Inquiry (Ocean)		
315	Status Details (Ocean)		
322	Terminal Operations Activity (Ocean)		
323	Vessel Schedule and Itinerary (Ocean)		
324	Vessel Stow Plan (Ocean)		
350	U.S. Customs Release Information (Ocean)		
353	U.S. Customs Master In-Bond Arrival (Ocean)		
354	U.S. Customs Automated Manifest Archive Status (Ocean)		
361	Carrier Interchange Agreement (Ocean)		
404	Rail Carrier Shipment Information		
410	Rail Carrier Freight Details and Invoice		
414	Rail Carhire Settlements		
417	Rail Carrier Waybill Interchange		
418	Rail Advance Interchange Consist		
426	Rail Revenue Waybill		
429	Railroad Retirement Activity		
431	Railroad Station Master File		
466	Rate Request		
468	Rate Docket Journal Log		
485	Ratemaking Action		
490	Rate Group Definition		
492	Miscellaneous Rates		
494	Scale Rate Table		
511 ^c	Requisition		<u>DD Form 1348, DA2765, Requisitions</u>
517 ^a	Material Obligation Validation (MOV)		<u>MOV</u>
527 ^c	Material Receipt		<u>Material Due-in/Receipt</u>
561 ^a	Contract Abstract		<u>Contract Abstract and Acknowledgment</u>
536 ^a	Logistics Reassignment		<u>Logistic Reassignment</u>
567 ^c	Contract Completion Status		<u>Contract Completion Status</u>
568 ^a	Contract Payment Management Report		<u>Contract Payment Notice</u>
602 ^a	Transportation Services Tender	MT 364R	CSCSC Reporting
800 ^c	Project Schedule Reporting		

Note: Material transactions will replace Military Standard Requisition and Issue Procedures/Military Standard Transaction Reporting and Accounting Procedures (MILSTRIP/MILSTRAP) transactions and their Military Standard Petroleum System (MILSPETS) corollaries. DA = Department of the Army; CSCSC = Cost Schedule Control System Criteria.

^a Not yet approved.

^b In development.

^c Approved for Version 3-Release 3 Dec. 1992.

ASC X12 Transaction Set ID	ASC X12 Standard Title	DMRD 941 Form	Other Uses
810	Invoice	SF 1443, SF 1113, DD Form 1898	<u>DoD Invoices</u> , Commercial Invoices, Public Vouchers, Request for Progress Payments
811	Consolidated Service Invoice/Statement		
812	Credit/Debit Adjustment		
815	Cryptographic Service Message		<u>Invoice Adjustments</u>
819	Operating Expense Statement		
820	Payment Order/Remittance Advice	SF 1443, SF 1113	Remittance Advice in EFT
821	Financial Information Reporting		
822	Customer Account Analysis		
823	Lockbox		
824	Application Advice	All	All
826	Tax Information Reporting		
827	Financial Return Notice		
828	Debit Authorization		
829	Payment Cancellation Request		
830	Planning Schedule with Release Capability		<u>War Materiel Requirements</u>
832	Price/Sales Catalog		Price/Sales Catalog
835	Health Care Claim Payment/Advice		
836	Contract Award		Notice of Award
838	Trading Partner Profile	SF 129	Trading Partner Agreement, Registration/ Acknowledgment
839	Project Cost Reporting		CSCSC Reporting
840	Request for Quotation	SF 18	RFB, RFP, IFB, etc.
841	Specifications/Technical Information		CALS Data Envelope, Technical parts of Bid Sets
842	Nonconformance Report	SF 361, SF 364, <u>SF 368</u>	
843	Response to Request for Quotation		Quotes, Bids and Proposals
844	Product Transfer Account Adjustment		
845	Price Authorization Acknowledgment/Status		Price and Availability
846	Inventory Inquiry/Advice		<u>Small Arms Reporting</u>
848	Material Safety Data Sheet		<u>MSDS and HAZMAT Reporting</u>
849	Response to Product Transfer Account Adjustment		
850	Purchase Order	DD Form 1155	Contracts

Note: RFB = Request for bid; RFP = request for proposal; IFB = invitation for bid; MSDS = Material Safety Data Sheet; HAZMAT = hazardous materials.

ASC X12 Transaction Set ID	ASC X12 Standard Title	DMRD 941 Form	Other Uses
851	Lease Schedule		
852	Product Activity Data		
855	Purchase Order Acknowledgment		To Create bilateral agreement
856	Ship Notice/Manifest	DD Form 250, DD Form 1898	<u>In-transit Visibility,</u> <u>Shipment Status</u>
857	Shipment and Billing Notice		<u>Shipment Performance</u> <u>Notice, Manifests, and</u> <u>Destination Acceptance</u> <u>Alert</u> (Combined Ship Notice/Invoice)
858	Shipment Information	SF 1103, SF 1203, 619/619-1	<u>TCMD</u>
859	Freight Invoice	SF 1113	
860	Purchase Order Change Request – Buyer Initiated	SF 30	Contract Modifications and Charges to Contract and Solicitations
861	Receiving Advice/Acceptance Certificate		<u>Receiving Report</u>
862	Shipping Schedule		
863	Report of Test Results		Adjunct to PQDRs
864	Text Message		
865	Purchase Order Change Acknowledgement/ Request – Seller Initiated		In lieu of paper-based correspondence, change order/acknowledge
866	Production Sequence		
867	Product Transfer and Resale Report		<u>Issue Backorder &</u> <u>Demand</u>
868	Electronic Form Structure		X12 data maintenance
869	Order Status Inquiry		
870	Order Status Report		<u>Requisition Status,</u> <u>Revised Deliver Forecast</u> <u>and PCO Response</u>
872	Residential Mortgage Insurance Application		
878	Product Authorization/Deauthorization		
879	Price Change		Adjunct to 832
888	Item Maintenance		<u>Storage Item Correction</u>
889	Promotion Announcement		
894	Delivery/Return Base Record		Inventory Records
895	Delivery/Return Acknowledgement and/or Adjustment		Inventory Records
896	Product Dimension Maintenance		

Note: TCMD = Transportation Control and Movement Document; PQDRs = Product Quality Deficiency Reports; PCO = Purchasing Contracting Officer.

ASC X12 Transaction Set ID	ASC X12 Standard Title	DMRD 941 Form	Other Uses
940	Warehouse Shipping Order	•	<u>Material Release Order</u>
943	Warehouse Stock Transfer Shipment Advice		
944	Warehouse Stock Transfer Receipt Advice		
945	Warehouse Shipping Advice		<u>Material Release Advice</u>
947	Warehouse Inventory Adjustment Advice		<u>Inventory Adjustment</u>
980	Functional Group Totals		
990	Response to a Load Tender		
996	File Transfer	All	All
997	Functional Acknowledgment		

Source: EDI Implementation Guide, Hardcastle, T., 1992

APPENDIX C

ELECTRONIC DATA INTERCHANGE PURCHASE ORDER

DCA #88-13

253.3-27

DEPARTMENT OF DEFENSE FORMS

253.303-70-DD-1155
 DD Form 1155: Order for Supplies or Services
 (See 213.505-2 and 216.703 (c) (s-72.)

INSTRUCTIONAL USE ONLY

ORDER FOR SUPPLIES OR SERVICES				Page 1 of 1	
<p>Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Service, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0345-017), Washington, DC 20503.</p>					
1. CONTRACT / ORDER NO. F346C1-88-C-6605		2. DELIVERY ORDER NO. CCCW		3. DATE OF ORDER 29 May 89	
4. ORDER BY Aviation Supply Office Robbins Avenue Philadelphia, PA 15111		5. ORDERED BY (if other than 4) General Electric Naplantrepe		6. DISCOUNT / PRICE REDUCTION NO. SCD-C	
7. CONTRACTOR General Electric Co. Aircraft Engine Business Group 1000 Western Avenue Lynn MA 01910 Point of Contact (See) Invoice*		8. FACILITY CODE		9. DISCOUNT SERIES <input type="checkbox"/> DISC <input type="checkbox"/> CHG <input type="checkbox"/> DISC/CHG	
10. DELIVERY TO FOR FROM BY (EXEMPT) 17 Dec 90 (90351)		11. ORDER NUMBER W00288		12. ORDER INVOICE NO. See block 15	
13. DATE OF ORDER See schedule		14. PAYMENT WILL BE MADE BY Naval Publication & Forms Center ICA G06 Section - 7222 5801 Yaber Avenue Philadelphia, PA 19120-5096		15. MAKE ALL PAYMENTS AND PAYEE WITH CONTRACT OR ORDER NUMBER	
<p>16. DELIVERY METHOD: <input checked="" type="checkbox"/> DELIVERY TO BE MADE BY CONTRACTOR'S OWN VEHICLE OR BY OTHER MEANS AS SPECIFIED IN THE ORDER. <input type="checkbox"/> DELIVERY TO BE MADE BY THE ORDERING OFFICE OR BY OTHER MEANS AS SPECIFIED IN THE ORDER.</p>					
<p>17. ORDERING AND DELIVERY DATA / LOCAL USE AA 17x4511.2310 000 34003 0 000383 7R CC0000 GCCM00A98EQ 7AC909</p>					
18. ORDER NO.		19. GENERAL OF SUPPLIES / SERVICE		20. QUANTITY ORDERED / ACCEPTED	
001		NSN 1R 3020-00-5080982 HQ Total Item Qty Gear, Reval Part NR 3020Y21901 Mil-std-736 2R/1/1/10/GA/CF/X/D3/0/00/A/BA/AR FOA Origin Accept Origin FOA by: General Electric Naplantrepe Mark for: Receiving-Officer-Non-MILSTRIP		10 ea	
0001AA 0001AB		Del by 17 Dec. 90 Del by 17 Dec. 90		3 ea 7 ea	
0001AB		Ship to: H00146 H00244		12,183.70	
21. QUANTITY ORDERED BY THE ORDERING OFFICE		22. ORDERED BY (if other than 4)		23. TOTAL	
24. QUANTITY ORDERED BY THE ORDERING OFFICE		25. ORDERED BY (if other than 4)		26. DIFFERENCE	
27. ORDERED BY (if other than 4)		28. ORDERED BY (if other than 4)		29. ORDERED BY (if other than 4)	
30. ORDERED BY (if other than 4)		31. ORDERED BY (if other than 4)		32. ORDERED BY (if other than 4)	
33. ORDERED BY (if other than 4)		34. ORDERED BY (if other than 4)		35. ORDERED BY (if other than 4)	
36. ORDERED BY (if other than 4)		37. ORDERED BY (if other than 4)		38. ORDERED BY (if other than 4)	
39. ORDERED BY (if other than 4)		40. ORDERED BY (if other than 4)		41. ORDERED BY (if other than 4)	
42. ORDERED BY (if other than 4)		43. ORDERED BY (if other than 4)		44. ORDERED BY (if other than 4)	
45. ORDERED BY (if other than 4)		46. ORDERED BY (if other than 4)		47. ORDERED BY (if other than 4)	
48. ORDERED BY (if other than 4)		49. ORDERED BY (if other than 4)		50. ORDERED BY (if other than 4)	

DD Form 1155, SEP 88

Previous editions are obsolete

CONTRACTOR MUST SUBMIT FOUR COPIES OF INVOICE

DoD FAR SUPPLEMENT

MAPPING OF A PURCHASE ORDER TO THE TRANSACTION

ST*850*0001@
BEG*00*SA*F346C188C6605*CCCW*890529**NA@
REF*AT**AA 17X4911.23100003400300003837R0CC000GCM00A98EQTAC909@
REF*DS*D0A1@
PER*BD*J. ZEMAITIS*TE* (215) 697-3730@
FOB*PP*DE@
IDT*08*3*1*701231****121.84@
N1*BT**10*N00288@
N1*BY**10*N00383@
N1*OI**10*N68525@
N1*PR**10*N00288@
N1*SE**M2*N99207@
PO1*1*10*EA***FS*1R3020-00-5080982 E*PD*5020Y21P01*FS,GEAR,BEVEL*
PG*MIL-STD-736*PG@
SCH*3*EA*ST*H00146*002*901217@
SCH*7*EA*ST*N00244*002*901217@
MAN*P8*RECEIVING OFFICER NON-MILSTRIP@
CTT*1*10@
AMT*TT*12183.70@
SE*19*0001@

Source: Navy EDI/CALS Workshop, 1992

APPENDIX D
Executive Summary
MODERNIZATION OF DEFENSE LOGISTICS
STANDARD SYSTEMS (MODELS) (LMI Report DL902R1)
Volume I: Establishing the Functional Baseline

In the early 1960's, DoD established single-item managers for acquiring, managing and distributing material. That approach required significant exchanges of logistics data among the Military Services, Defense Agencies, and the General Services Administration. To support those exchanges effectively and efficiently, DoD defined standard message formats, data elements terminology and procedures. This created the Defense Logistics Standard Systems (DLSS).

The DLSS have now been used successfully for DoD logistics transactions for nearly 30 years. However, the DLSS have not been modernized as rapidly as the surrounding environment and have not kept pace with user information requirements. To capitalize on technology advances and satisfy its logistics information requirements into the next century, DoD established the MODELS project to redesign the DLSS.

A fundamental design criterion in MODELS is flexibility. MODELS is designed for compatibility with ongoing or planned modernization of Service and agency automation projects. Thus new initiatives, such as the Corporate Information Management (CIM) effort and numerous Defense Management Report Decisions, provide excellent methods for the deliberate implementation of the significant improvements MODELS brings to logistics processes.

This report documents the progress made over the past 3 years and recommends actions to further improve DoD's logistics capabilities. The DLSS replacement system was initially released as the *Defense Logistics Management System (DLMS) - Functional Baseline, Electronic Data Interchange (EDI)*

Standards in May 1990. The MODELS baseline contains 56 variable-length transactions that perform all functions previously performed by the more than 400 card-image DLSS transactions. In addition the baseline incorporates more than 75 enhancements to The DLSS that were requested by the Services and agencies. The DLMS format is derived from the American National Standards Institute (ANSI) Accredited Standards Committee X12 (ACS X12) for EDI tailored to meet DoD-unique requirements. EDI is a rapidly growing tool used in industry to reduce paper and improve business efficiency and has recently been adopted as a Federal Information Processing Standard.

The first update to the DLMS baseline was published in September 1991 as Version 1.1. That update reflects changes to the baseline recommended by the Services and agencies. The purpose of the next update, version 2.0, is to make the DLMS transactions national standards that are fully approved by ANSI X12. Version 2.0 is projected for completion by February 1993.

We recommend that OSD encourage the incremental implementation of Version 1.1 beginning in 1992. and mandate the initiation of implementation of Version 2.0 no later than October 1995. Now that steps to implement the DLMS are in motion, we recommend that the MODELS project pursue five additional logistics improvements:

- Expand asset visibility capabilities.
- Consolidate supply, quality, and transportation discrepancy reporting into a single standard procedure.
- Incorporate maintenance in the standard system.
- Convert procurement documents to EDI.
- Integrate the DLMS (including the recommendations above into the DoD CIM initiative.

APPENDIX E

**Executive Summary
MILITARY HANDBOOK 59A
DEPARTMENT OF DEFENSE
COMPUTER-AIDED ACQUISITION AND LOGISTIC SUPPORT (CALS)
PROGRAM IMPLEMENTATION GUIDE**

Computer-aided acquisition and logistic Support (CALS) is a DoD and Industry strategy to enable, and to accelerate the integration of digital technical information for weapon system acquisition, design, manufacture, and support. CALS will provide for an effective transition from current paper-intensive weapon system life cycle processes to the efficient use of digital information technology. The purpose of CALS is to improve industry and DoD productivity and quality, and thus improve supportability, military readiness and combat effectiveness. The objectives of CALS are:

a. To accelerate the integration of design tools such as those for reliability and maintainability into contractor computer-aided design (CAD) and engineering systems as part of a systematic approach that simultaneously addresses the product and its life-cycle manufacturing and support requirements.

b. To encourage the reduction and eventual elimination of duplication of data, and to accelerate the automation and integration of contractor processes for generating weapon system technical data in digital form.

c. To rapidly increase DoD's capabilities to receive, store, distribute, and use weapon system technical data in digital form to improve life-cycle maintenance, training, and spare parts procurement, and other support processes. Currently, a variety of automated systems are used by weapon system contractors working as a production team to enter,

update, manage, and retrieve data from data bases associated with specific acquisition programs. Many of these systems are incompatible with one another as well as with similar systems employed by the Government to receive, store, process, and use delivered technical data. The functional capabilities supported by these diverse systems vary greatly. Data created in one functional process is often manually re-entered or re-created in subsequent functional processes, thereby introducing errors and increasing costs.

The near-term goals for CALS implementation are attainment of increased levels of interfaced, or integrated, functional capabilities, and specification of requirements for authorized Government access to contractor technical data bases, or for delivery of technical data to the Government in digital form. These specifications are designed to comply with widely accepted commercial standards developed for these purposes.

The longer-term goal of CALS is integration of industry and DoD data bases to share common data in an Integrated Weapon System Data Base (IWSDB) structure that is implemented through Contractor Integrated Technical Information Services (CITIS). Data deliverables from, or Government access to specified segments of CITIS data will be explicitly required in future contracts, developed in accordance with CALS standards and procedures. The technology to accomplish this will be incrementally implemented as emerging technologies are developed and proven.

A major objective of CALS is to facilitate concurrent engineering. This process examines and modifies design and engineering processes to integrate other disciplines, such as producibility, reliability, maintainability, and supportability, into each phase of the weapon system design and production process. This can significantly shorten the acquisition cycle and allow earlier fielding of new weapon systems. At the same time concurrent engineering actually

reduces the risk of failure by ensuring that manufacturing, maintainability, supportability, and schedule to avoid costly delays and redesign during development, and loss of availability during the operational phase....

Source: Department of Defense, Military Handbook (MIL-HDBK-59A)
28 September 1990.

APPENDIX F

ELECTRONIC DATA INTERCHANGE TRANSACTION SETS IN USE OR PLANNED FOR IMPLEMENTATION IN 1993

SYSTEM	FUNCTION	TYPE OF PROCUREMENT ACTION	EXPECTED EDI CAPABILITY CY 1993
ITIMP Integrated Technical Item Management and Procurement	Navy Inventory Control Point Procurement Support	Large and Small Procurement Actions	810, 820, 832, 841, 843, 850, 855, 860
APADE Automation of Procurement and Accounting Data Entry	Navy Field Contracting System Procurement Support	Large and Small Procurement Actions (primarily small)	840, 843, 850,
EASE Electronic Assisted Solicitation Exchange	Exchange RFQs and Response to RFQs	Integrated with the APADE System	840, 843
STARS/SEPS Standard Accounting and Reporting System/ STARS Electronic Processing System	Navy Accounting and Accounts Payable System	Accounting and Bill Payment	810, 811, 850, 856
SAMMS/SPEDE Standard Automated Material Management System SAMMS Procurement by Electronic Data Exchange	DLA Supply Center Automated Procurement System	Large and Small Procurement	805, 810, 820, 840, 843, 852, 850, 855, 856, 858, 860
POPS Paperless Order Placement System	DLA Supply Center Procurement System	Delivery Orders for Direct Vendor Delivery	Proprietary Transaction Sets

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